COMPAQ

# SW3322/SW3323/SW3324 Dual-Speed Switch User Guide

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***Compaq SW3322/SW3323/SW3324 Dual-Speed Switch User Guide***

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# Preface

This manual includes information about how to install, configure, and operate the Compaq SW3322/SW3323/SW3324 Dual-Speed Switch. We recommend that you read all chapters in this manual to become familiar with the switch's features and to ensure a successful installation.

## Audience

This guide is intended for Ethernet local area network (LAN) administrators and Management Information Systems (MIS) personnel with the following background:

- Working knowledge of Ethernet LANs
- Familiarity with Transmission Control Protocol/Internet Protocol (TCP/IP) and Simple Network Management Protocol (SNMP)

## Formatting Conventions

The following are formatting conventions found in this guide.

- **Keys** you are instructed to press appear in boldface type. For example, press the **Enter** key.
- ***Italics*** — Table names, menus, menu selections, special names, and words used for emphasis appear in italics.

Special types of messages throughout this guide are explained below.

**WARNING:** Text set off in this manner indicates that failure to follow directions in the warning can result in bodily harm or loss of life.

**CAUTION:** Text set off in this manner indicates that failure to follow directions can result in damage to equipment or loss of information.

**IMPORTANT:** Text set off in this manner presents clarifying information or specific instructions.

**NOTE**: Text set off in this manner presents information of interest.

## Keyboard Entries

This guide uses the following conventions for keyboard entries:

- When you read "enter," type the text and press the <Enter> key.

  Example: Enter the Gateway IP address and press the <Enter> key.

- When you read "select," type the letter associated with the parameter.

  Example: Select **a** from the System Configuration Menu to view the SNMP Configuration Menu.

## Other Conventions

This guide uses the following typographical conventions:

- Initial Caps — Menu titles and console menu selections
- <Enter> — Used to designate the Enter or Return key.
- ALL CAPS — Used to designate fields within the console menus. (Example: CONNECTION)
- `courier font` — Screen messages and user prompts.
- Selection — Describes a user-configurable user interface item.
- Field — Describes a read-only information item.

## Organization

**Chapter 1, Overview**: Describes the features of the switch, front and rear panel components and application examples.

**Chapter 2, Installation**: Describes the content of your switch shipment, lists site requirements, and provides mounting instructions. Instructions for making connections and powering up the switch are provided as well.

**Chapter 3, User Interface**: Describes the user interface console menus and lists the factory defaults for system settings. Each menu is presented along with a description of the selections/fields available within the menu.

**Chapter 4, Configuring and Monitoring the Switch**: Describes common tasks and associated steps required to configure the switch, and covers common switch and network considerations required to ensure system integrity.

**Chapter 5, SNMP Management**: Describes how the Simple Network Management Protocol (SNMP) communication protocol is used to manage the switch, and provides a description of industry standard and proprietary Managed Information Bases (MIBs) supported by the switch.

**Appendix A, Technical Specifications**: Provides a list of standards compliance and certifications as well as physical and operational specifications.

**Appendix B, Spanning Tree Concepts**: Describes Spanning Tree Protocol and how it is used to resolve the problems of physical loops in a network.

**Appendix C, Virtual LANs (VLANs)**: Describes how the switch uses VLANs to create isolated network domains, and provides illustrations of VLAN switch configurations.

**Appendix D, Class of Service**: Describes how the traffic Class of Service features can be used to assign mission-critical data a higher priority through the switch by delaying less critical traffic during periods of congestion.

**Appendix E, Acronyms and Abbreviations**: Defines common acronyms and abbreviations used within the user guide and the networking industry.

**Appendix F, Regulatory Compliance**: Provides information about compliance with requirements of various regulatory agencies.

# *Chapter 1*
# Overview

## Description

This user guide describes the Compaq SW3322, SW3323, and SW3324 Dual-Speed Switch. These IEEE 802.1D-compliant Ethernet switches support 24 IEEE 802.3u 100Base-TX Fast Ethernet ports. Each port can alternatively operate as an IEEE 802.3i 10Base-T port. Additionally, the SW3324 switch features two Gigabit Ethernet ports which operate at 1 Gb/s. These ports support the various physical media transceiver flavors of IEEE 802.3z Gigabit Ethernet through the use of modular Gigabit Interface Converters (GBICs). Supported media includes multimode fiber, single mode fiber. You can configure the SW3323 switch, pre-installed with a modular card, so that Ports 1 and 2 support Fast Ethernet over fiber (IEEE 802.3u).

The switch automatically learns addresses and stores them in a Media Access Control (MAC) address forwarding table. Each port on the switch operates at full Fast Ethernet wire speed with full address and frame filtering. The switch has complete non-blocking performance, capable of forwarding minimum size packets at full wire speed on all ports simultaneously in full duplex mode.

The switch contains advanced features such as Remote Monitoring (RMON), IEEE 802.1Q virtual LANs (VLANs), IEEE 802.1p Class of Service, flow control, and broadcast throttling. For network management, the switch includes a standards-compliant Simple Network Management Protocol (SNMP) agent. This agent allows network management station applications (such as Compaq Networking Management Software, included with the switch) to collect and present status and performance information about a switch. In addition, it provides the ability to configure and control functions on the device. Network management can also be performed in-band using the popular TCP/IP application, Telnet. In addition, a serial console port allows out-of-band management using a PC or ASCII terminal.

The switch is desktop or rack-mountable. LEDs on the front panel provide information about the operating status of the switch. The back panel of the switch contains the power connector and a power switch. Two fans maintain ventilation and cooling for internal switch components.

## Features

- Ports:
  - SW3322 -24 dual-speed 10Base-T/100Base-TX RJ-45 ports
  - SW3323 - 22 dual-speed 10Base-T/100Base-TX RJ-45 ports plus two 100Base-FX ports (for SW3323with fiber card pre-installed)
  - SW3324 - 24 dual-speed 10Base-T/100Base-TX RJ-45 ports plus two 1000Base-X ports (Optional GBIC module for 1000Base-LX)
- Architecture:
  - 8-port 10/100 switch ASIC in a distributed switching architecture
  - 4.2 Gb/s internal switching fabric
  - 12 MB packet buffering (512 KB/port) for SW3322 and SW3323
  - 28 MB packet buffering for SW3324
  - MAC address supported per switch ASIC 4096

    | | |
    |---|---|
    | SW 3322/23 | 12,288 |
    | SW3324 | 20,480 |

  - IEEE 802.3u auto-negotiation for full/half duplex and 10/100 Mb/s speed operation on all RJ-45 ports
  - High performance store-and-forward switching
- Performance:
  - Wire speed with minimum size packets on all ports simultaneously in full duplex mode
  - Forwarding: 3.6 million packets-per-second (64 byte packets)
  - Filtering: 3.6 million packets-per-second (64 byte packets)
- Traffic Management:
  - Tagging and port-based VLANs per the IEEE 802.1Q draft standard - up to 4094 VLANs per switch
  - Traffic Class of Service support using the IEEE 802.1p draft standard
  - Flow control per port: receives IEEE 802.3x frames

- Broadcast throttling for broadcast storm control

- Network Management:
  - SNMP compliant agent: MIB II (RFC 1213), Bridge MIB (RFC 1493), Ethernet MIB (RFC 1398), RMON - Statistics, History, Alarm and Event groups per port (RFC 1757), private MIB extensions
  - As a standard feature, Compaq Network Management Software is included at no additional charge with the switch. You can immediately configure the switch, get detailed port-level information, graph performance statistics, and more.
  - Port mirroring for network monitoring and analysis
  - Telnet
  - Console port, RS-232, DB-9 connector, null modem
  - BootP/DHCP for IP address configuration
- LED Indicators:
  - 10Base-T/100Base-TX Ethernet ports: Link, Activity, Full Duplex, 100Mb/s Speed
  - 100Base-FX: Link, Activity
  - 1000Base-X GBIC ports: Link, Activity on base unit
  - System: Power, Test
- Software:
  - Extensive software diagnostics for product testing and troubleshooting
  - Software upgrades using the front panel console port or in-band with TFTP

# Front Panel

Figure 1-1 shows the front panel of the SW3322, SW3323, and SW3324 switch.

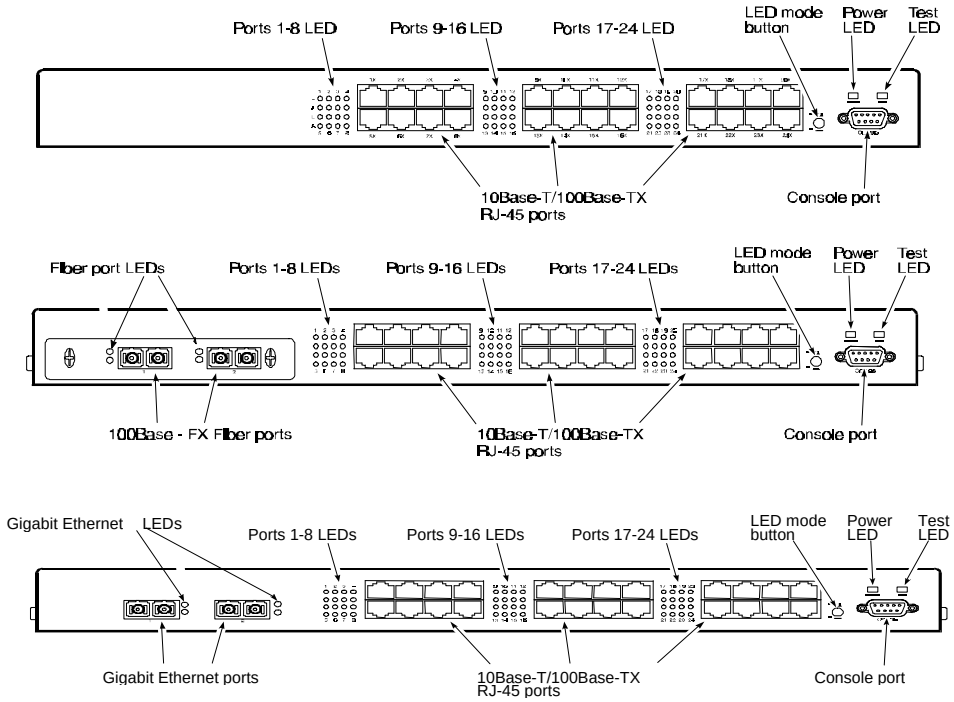



**Figure 1-1** SW3322, SW3323, and SW3324 Front Panel

Figure 1-2 shows the Link (L) and Activity (A) port LEDs for 24 10Base-T/100Base-TX ports (default configuration). Pressing the front panel LED mode button changes the operation of these LEDs to Full Duplex (L) and 100M Speed (A), as shown in Figure 1-3.

**NOTE:** The numbers above and below the L/A port LEDs report performance for a specific RJ-45 port.

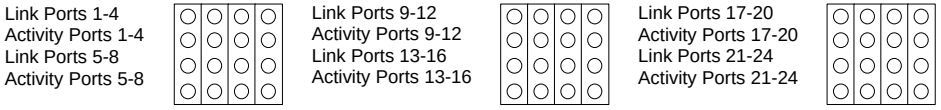



**Figure 1-2** Port LEDs (L/A) Default Configuration

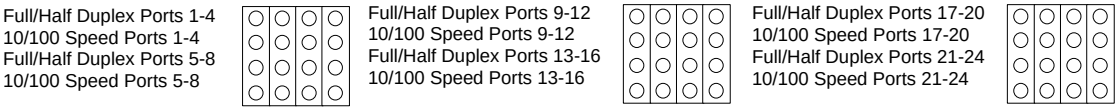

Full/Half Duplex Ports 1-4
10/100 Speed Ports 1-4
Full/Half Duplex Ports 5-8
10/100 Speed Ports 5-8
Full/Half Duplex Ports 9-12
10/100 Speed Ports 9-12
Full/Half Duplex Ports 13-16
10/100 Speed Ports 13-16
Full/Half Duplex Ports 17-20
10/100 Speed Ports 17-20
Full/Half Duplex Ports 21-24
10/100 Speed Ports 21-24

**Figure 1-3** Port LEDs (L/A) LED Mode Button Pressed

Table 1-1 defines the front panel components.

**Table 1-1**
**Front Panel Components**

| Name | Function |
|---|---|
| 100Base-FX Fiber Ports (Ports 1 and 2)(SW3323 with fiber card pre-installed) | Multi-mode fiber ports used with SC fiber connectors. Indicates Link and Activity information. |
| Gigabit Ethernet ports 25 and 26 LEDs (SW3324) | Indicates Link and Activity information |
| 1000Base-X Gigabit Ethernet ports SW3324) | Gigabit Ethernet ports using GBIC modules |
| Fiber Ports 1 and 2 LEDs (SW3323 with fiber card pre-installed) | Indicates Link and Activity information (see Table 1-2 for details). |
| Ports 1-24 RJ-45 LEDs (SW3322) | Indicates Link, Activity, Speed and Duplex information (see Table 1-2 for details). |
| LED mode button | Button used to switch RJ-45 port LEDs between Link/Activity mode and 100M/Full Duplex mode. This button has no affect when using Multi-mode fiber Ports 1 and 2 (SW3323). |
| Power LED | Lights steady green to indicate power is supplied to the switch. Off indicates no power is supplied to the switch. |
| Test LED | Lights steady green after a reset and remains on until successful completion of power-on self tests. Off indicates a successful completion of the power-on self tests. |
| Console port | DB-9 connector configured as a null modem connection for serial out-of-band management using the console menus. |

The port LEDs are grouped to the left of their corresponding RJ-45 ports. Table 1-2 defines the performance of the port LEDs for the 10Base-T/100Base-TX ports in the default configuration.

**Table 1-2**
**Port LEDs Defined**

| Name | Function |
|---|---|
| Gigabit Ethernet Ports | L LED On: Indicates a valid connection (link) on the associated port. |
| | L LED Off: Indicates no link on the associated port. |
| | A LED flashing: Indicates the presence of transmit and/or receive activity. |
| | A LED Off: Indicates the absence of transmit or receive activity. |
| RJ-45 Ports Default Configuration | L LED On: Indicates a valid connection (link) on the associated port. |
| | L LED Off: Indicates no link on the associated port. |
| | A LED flashing: Indicates the presence of transmit and/or receive activity. |
| | A LED Off: Indicates the absence of transmit or receive activity. |
| RJ-45 LED mode button pressed | L LED On: Port is in the full duplex mode. |
| | L LED Off: Port is in the half duplex mode. |
| | A LED On: Indicates the port is in the 100Base-TX mode. |
| | A LED Off: Indicates the port is in the 10Base-T mode. |
| Fiber Ports (SW3323) with fiber card pre-installed | Link LED On: Indicates a valid connection (link) on the associated port. |
| | Link LED Off: Indicates no link on the associated port. |
| | Activity LED flashing: Indicates the presence of transmit and/or receive activity. |
| | Activity LED Off: Indicates the absence of transmit or receive activity. |

## Rear Panel

Figure 1-4 shows the SW3322/SW3323/SW3324 rear panel and Table 1-3 defines the rear panel components.

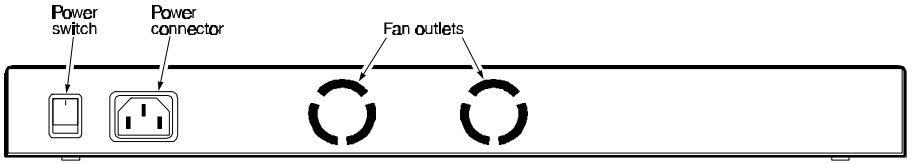



**Figure 1-4** SW3322/SW3323/SW3324 Rear Panel

Table 1-3 defines the performance of the port LEDs for the 10Base-T/100Base-TX ports with the LED mode button pressed.

**Table 1-3**
**Rear Panel Components**

| Name | Function |
|---|---|
| Power Connector | Provides AC power to the switch. For information about power requirements and power cords for use with the switch, see Appendix A, "Technical Specifications." |
| Power Switch | Allows you to turn the switch power on and off. |
| Fan Outlets | Air exit vents through which internal fans discharge air for ventilation purposes. |

# Feature Summaries

The following summaries provide a brief description of the switch features in areas such as standards compliance, functionality, performance, and options.

## IEEE 802.1D Bridge

The Compaq switch is fully compliant with IEEE 802.1D transparent bridging specifications. An aggregate address table containing 4096 entries per 8 switch ports is provided for learning, filtering, and forwarding. The 24-port switch can support up to a maximum of 12,288 addresses. Addresses are automatically learned by the switch, and can be individually assigned specific forwarding treatment by the network administrator if desired. Forwarding table configuration can be made out-of-band via the console interface or in-band via SNMP or Telnet. Static and dynamic addresses are both stored in this table. One static address is assigned per port by default. The Forwarding Table Configuration screen in the console menus allows you to assign additional static addresses if required.

## Spanning Tree Protocol

The switch supports the IEEE 802.1D Spanning Tree Protocol. This protocol allows redundant connections to be created between different LAN segments for purposes of fault tolerance. Two or more physical paths between different segments can be created through the switch, with the Spanning Tree Protocol choosing a single path at any given time and disabling all others. If the chosen path fails for any reason, a disabled alternative is activated, thereby maintaining the connection. This prevents network traffic from circulating in an endless loop formed by multiple connections to the same LAN segment.

The switch is shipped from the factory with Spanning Tree operation disabled. Spanning Tree parameters are configurable in the Spanning Tree Configuration Menu using the console menus or via SNMP (see Appendix B, “Spanning Tree Concepts” for more information).

## Frame Buffering and Frame Latency

The switch is a store-and-forward switching device. Each frame is copied into switch memory before being forwarded to another port. This method ensures that all forwarded frames conform to a standard Ethernet frame size and have a correct cyclic redundancy check (CRC) for data integrity. This switching method prevents bad frames from traversing the network and using up valuable network bandwidth, as with cut-through switching technology.

To minimize the possibility of dropping frames on congested ports, the switch provides 4 MB of dynamically allocated frame buffering per 8 10/100 ports and 8 MB per gigabit port. This buffer space is used to queue packets for transmission on congested networks. This is an additional advantage over cut-through switching technology, which drops packets immediately when experiencing collisions.

## Software Download

The switch supports the industry-standard Trivial File Transfer Protocol (TFTP) for downloading software to the switch. All switch software is stored in a 1 MB sectored Flash ROM. The download feature allows you to easily install software upgrades to the unit. Compaq Networking Management Software includes a TFTP server and a configuration application to allow for the software downloads. Software can alternatively be downloaded via the serial console port using the XMODEM protocol.

A TFTP or XMODEM software download is invoked via the Download Software Menu using the console menus. A TFTP download can also be invoked via SNMP.

## Non-volatile Parameter Storage

Important operating parameters such as IP addresses, Spanning Tree configuration, and management security parameters, are stored in non-volatile Flash memory. These values are retained when the switch experiences power interruptions or is powered down for normal maintenance.

## Configuration and Management Interfaces

The switch can be managed using any of the following three methods:

- Serial console, out-of-band

  An RS-232 connection, using a DB-9 connector with null modem cable, is supported for out-of-band switch management. Serial console management is performed using a terminal, or computer system running communications software. See Chapter 3, “User Interface”, for more detailed information on managing the switch via the serial console.

- Telnet, in-band (over Ethernet)

  The switch supports management through a Telnet connection using the TCP/IP protocols. Telnet is performed using an ASCII terminal or computer system running communications software. See Chapter 3, “User Interface”, for more detailed information on managing the switch via the serial console. Global password protection for changing the operating parameters of the switch is provided.

- SNMP-based network manager, in-band

  The switch can be managed using SNMP, the most common protocol used today for network management. Standard agent MIBs embedded in the switch provide basic SNMP management through industry-standard SNMP applications.

Management security protection is provided based on SNMP community names. See Chapter 5, “SNMP Management”, for more information.

## RMON

RMON (Remote Monitoring) is a facility used to manage networks remotely while providing multi-vendor interoperability between monitoring devices and management stations. An SNMP MIB defines RMON. This MIB is divided into nine different groups, each gathering specific statistical information or performing a specific function. RMON-capable devices gather network traffic data and then store them locally until downloaded to an SNMP management station.

The switch supports four of the nine groups of RMON defined for Ethernet networks on a per port basis. Specifically, these are:

- Statistics: a function that maintains counts of network traffic statistics such as number of packets, broadcasts, collisions, errors, and distribution of packet sizes.
- History: a function that collects historical statistics based on user-defined sampling intervals. The statistical information collected is the same as the Statistics group, except on a time stamped basis.
- Alarm: a function that allows managers to set alarm thresholds based on traffic statistics. Alarms trigger other actions through the Event group.
- Event: a function that operates with the Alarm group to define an action that will be taken when an alarm condition occurs. The event may write a log entry and/or send a trap message.

RMON Statistics group information is displayed on the Port Statistics Screen in the console menus. Additional RMON functionality is available via SNMP.

## Port Mirroring

The switch includes the ability to mirror the traffic being switched on any port for purposes of network traffic analysis and connection integrity. When this feature is enabled, a protocol analyzer or RMON probe is connected to any port in a group of eight. This port is configured to mirror the traffic from any other port in the same group of ports. The groupings are ports 1-8, 9-16 and 17-24. You can only mirror one port to another port at one time. Port mirroring occurs at the same speed configured for the port (10Mb/s-to-10Mb/s or 100Mb/s-to-100Mb/s). Port mirroring is configurable in the Switch Configuration Menu using the console menus or via SNMP.

**NOTE**: Port mirroring is not supported on the Gigabit Ethernet ports.

## Auto-negotiation

Auto-negotiation is a process that permits the switch to automatically select the operational modes of its ports. Upon first being connected, the switch detects the speed of the connected network to the port, either 10Mb/s or 100Mb/s. In addition, the switch detects the type of communication setting, half or full duplex. The port is then automatically set by the switch to operate in the proper mode, without user intervention. It is not required that the network device to be connected to the switch support auto-negotiation as the switch automatically adjusts to the network device's communication settings. Auto-negotiation is configurable in the Port Configuration Menu of the console menus or via SNMP.

## Broadcast Throttling

Broadcast throttling is the capability of the switch to limit the number of packets that are flooded to all ports on the switch. Broadcast, multicast, and unknown destination address unicast packets are typically flooded to all ports of a switch or a VLAN. When the number of these types of packets being forwarded through the switch is large, the performance of the switch can suffer greatly. A programmable broadcast cutoff rate parameter allows a rate threshold to be set in the switch for the forwarding of broadcast and unknown destination address packets. If the cutoff rate is exceeded, further packets of these types are dropped. Broadcast throttling is configurable in the Switch Configuration menu of the console menus or via SNMP.

**NOTE:** The threshold on the rate of broadcast is set for the switch on a global basis.

## BootP/DHCP

The Bootstrap Protocol (BootP) and the Dynamic Host Configuration Protocol (DHCP) provide for the capability of passing configuration information to hosts on a TCP/IP network. Using this process, network devices do not need to be configured before they can communicate using the TCP/IP protocol suite. The switch uses BootP and DHCP to automatically configure IP address information without requiring access to the console menus. BootP/DHCP operation is configurable using the BootP/DHCP Enable option in the System Configuration Menu of the console menus or via SNMP.

## LEDs

The port LEDs on the switch provide a quick and accurate display of the integrity of switch connections and switch mode. The operation of the RJ-45 port LEDs can be changed by use of the LED mode button on the switch front panel. The LED mode button does not affect the operation of the fiber port LEDs. The default operation of the RJ-45 LEDs indicates Link (L) and Activity (A) for each of the ports. When the LED mode button is pressed (pressed and held in), the operation of the RJ-45 LEDs changes to indicate full/half duplex and 10/100 Mb/s speeds, respectively.

## Full Duplex Mode

The full duplex mode of operation on a port can double the throughput of switch connections. This mode disables the collision detection portion of the Ethernet Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol, allowing for two-way traffic. Full duplex is configurable using the Duplex Mode parameter in the Port Menu of the console menus or via SNMP.

## Flow Control

Flow control allows you to manage network traffic during congestion periods and to prevent the loss of packets when port buffer thresholds are exceeded. The SW3322/SW3323/SW3324 can receive pause frames being sent to it, and stop sending traffic on that port. You can configure this ability to receive and respond to pause frames on a port-by-port basis. The switch receives pause frames per the IEEE 802.3x standard.

## Virtual LANs (VLANs)

VLANs allow you to connect users to a specific LAN segment regardless of their physical location. The switch supports tagged VLANs per the IEEE 802.1Q draft standard. With frame tagging, a short tag is appended to every frame that crosses the network backbone. The tag identifies which VLAN the frame belongs to. See Appendix C, “Virtual LANs (VLANs),” for more information about this feature.

### Class of Service

Class of Service support allows you to assign a higher priority to selected traffic passing through the switch. The switches support Class of Service attributes per the IEEE802.1D/D5 (previously known as IEEE 802.1p) standard specification using a priority queuing mechanism. This feature ensures that traffic during congestion periods will not interfere with traffic assigned a higher priority. Traffic assigned a lower priority is subject to discard when memory is in short supply. See Appendix D, "Class of Service," for more information about this feature.

## Application Examples

The exploding popularity of the Internet and of corporate intranets, as well as new, high-bandwidth desktop applications, are driving the demand for Fast Ethernet. The increase in multimedia traffic and the need to support legacy protocols alongside new, data intensive applications is driving the need for network segmentation and traffic prioritization.

The SW3322/SW3323/SW3324 switch is ideal for meeting the needs of today's high performance networks. Their low cost and high port count make them affordable for dedicated 10/100Mb/s connections to the desktop. And their extensive features, including VLAN capability, provide the management needed for the workgroup and local backbone.

The following sections illustrate the switches employed in two examples:

- Client/Server Network
- Local Backbone

### Client/Server Network Application

To improve workstation performance in a client/server environment, the switches can be configured to provide 200 Mb/s full duplex Fast Ethernet connections to servers by connecting each to a dedicated switch port (Figure 1-5). Users can be accommodated through connections to hubs, both at 10Mb/s and 100Mb/s speeds, through 10Mb/s switches with 100Mb/s uplinks, or through direct connections. The fiber uplinks can connect the switch to the corporate backbone, which may be located on another floor or building.

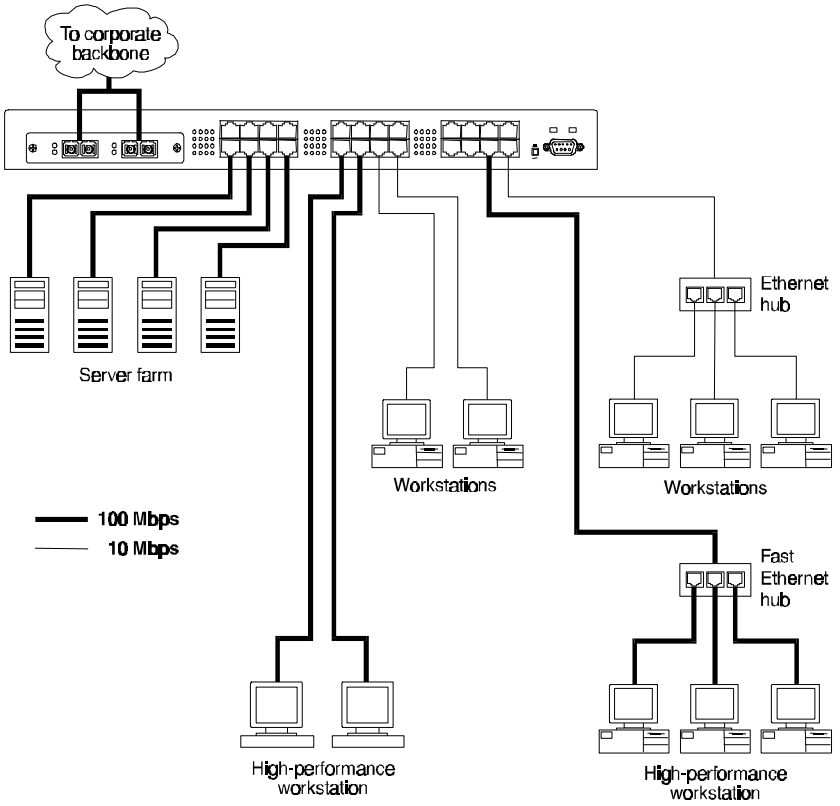



**Figure 1-5** Client/Server Network Application

## Local Backbone Application

The switch can be used in a local backbone application, connecting network segments together and providing file-server access (Figure 1-6). Workgroup hubs are provided with a single connection to the switch while servers are put on dedicated 100 Mb/s ports. Routers and other networking devices can connect off of the switched backbone as well. Fiber uplinks are available to connect the switch to the corporate backbone, which may be located on another floor or in a separate building.

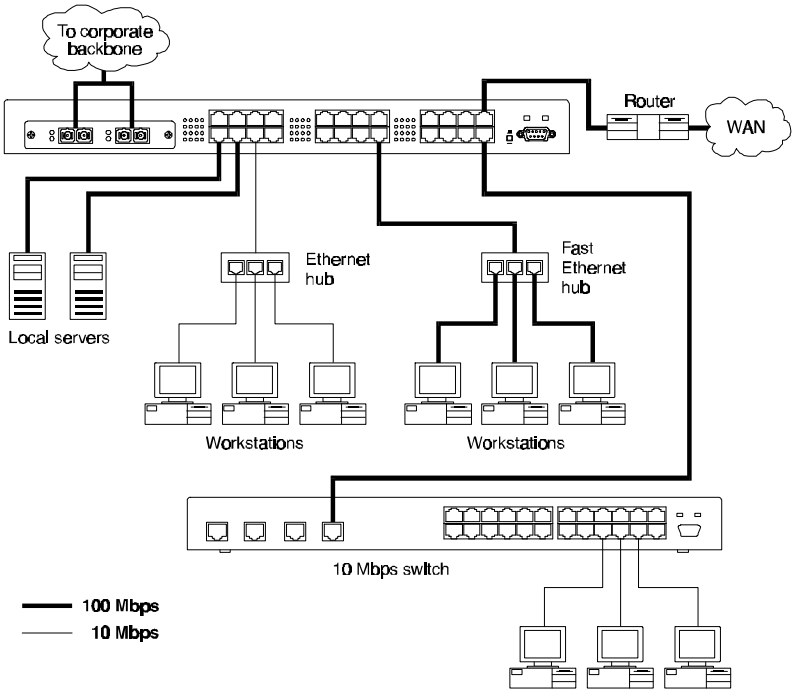



**Figure 1-6** Local Backbone Application

# *Chapter 2*
# Installation

## Inspecting Your Shipment

When you receive the shipment of your switch, check the package contents and make sure you have the following items:

- Compaq SW3322, SW3323, or SW3324 switch
- AC power cord
- Rack mount bracket kit
- *Compaq SW3322, SW3323, and SW3324 Switch Quick Install Guide*
- *Compaq Networking Management Software* CD
- *Compaq Network Management Product Management Module* CD SW3322, SW3323, SW3324 along with the User Guide
- Warranty and safety guide
- 1 1000Base-SX GBIC module pre-installed in SW3324

**NOTE:** Optional SX and LX Gigabit modules are available for the SW3324

| | |
|---|---|
| 338406-B21 | SX GBIC Module All |
| 338407-B21 | LX GBIC Module All |

## Site Requirements

Before you install the switch, make sure the site meets the following requirements:

- Mounting
  - Provide a flat table, shelf surface, or an optional 19 in. (48.3 cm) equipment rack
  - Use an EIA standard equipment rack that is adequately grounded and physically secure

- Power source
  - Provide a power source within six feet (1.8 m) of the installation location. This source must provide 100 VAC to 240 VAC, and 50 Hz to 60 Hz power. Power specifications for the switch are shown in Appendix A, “Technical Specifications”.
  - If multiple products are installed in the same rack system, the power source must be capable of handling the entire load. The overall system AC current load must not exceed 80 percent of the branch circuit AC current rating.
  - If power strips are used to connect multiple products, the load should not exceed 80 percent of the power strip's marked electrical current rating.
  - Maintain reliable grounding of rack-mounted equipment. Give special attention to power supply connections other than direct connections to the branch circuit, such as power strips and other power connector adapters.
  - Primary voltage selection within the above ranges is automatic and requires no user action.

**WARNING:** To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord-grounding plug or use a three-to-two pronged adapter at the outlet. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Disconnect power from the unit by unplugging power cord from the electrical outlet or from the back of the unit.
- Do not place anything on power cords or cables. Arrange them so that no one can accidentally step on or trip over them. Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the plug and pull if from the outlet. Do not pull the plug out by the cord.
- Do not overload the AC supply branch circuit that provides power to the rack. Consult the electrical authority having jurisdiction over your facility wiring and installation requirements.

- Environmental
  - Install the switch in a dry area, with adequate air circulation. Avoid placing the switch in direct sunlight or near other heat sources, such as hot-air vents. For temperature and humidity specifications, see Appendix A, “Technical Specifications”.
- Ventilation
  - Do not restrict airflow by covering or obstructing air inlets on the side of the switch or the rear panel internal air fan exits.
  - For proper ventilation, allow at least 2 inches (5.1 centimeters) on each side of the switch.
  - Wiring closets require approximately 2 feet (6.5 meters) in front of the rack to install and remove equipment.

## Mounting the Switch on a Table or Shelf

Mount the switch on a table or shelf in a position that allows access to the front panel RJ-45 ports, visibility of the port LEDs, and the power cord. Make sure that the mounting surface can safely support the switch and that there is adequate space around the switch for ventilation and cooling.

## Mounting the Switch in a Rack

The switch ships with two (2) multi-position mounting ears and four (4) mounting screws.

**NOTE:** The mounting screws are used to attach the mounting ears to the switch. Once the ears are attached to the switch, you will need to provide appropriate screws to mount the switch in a rack.

Figure 2-1 shows the orientation of the mounting ears for mounting the ears to the switch for a rack mount application. Mount the switch with the front panel facing forward. Do the following:

1. Mount one of the ears to the switch using two (2) of the supplied screws. Repeat this step for the other side of the switch.
2. Slide the switch into the rack and align the holes in the rack mounting ears with the holes in the rack rails.
3. Insert and tighten appropriate rack-mounting screws (not provided).

**WARNING:** To reduce the risk of personal injury or damage to the equipment, be sure each rack is level and stable. Rack frames should be coupled together or otherwise secured to the building structure to maintain stability. This must be accomplished before performing any work on the rack.

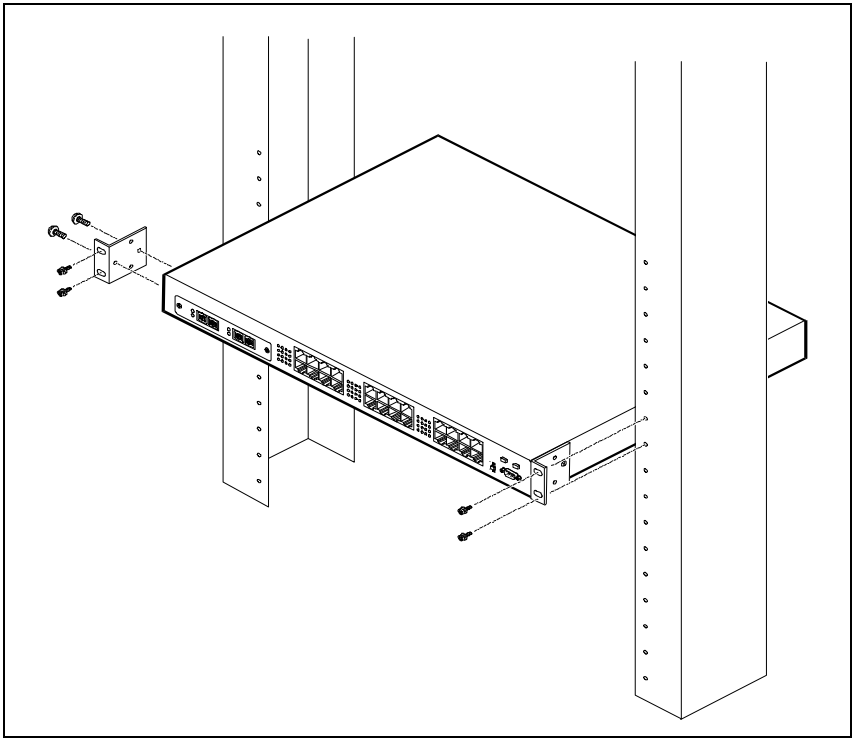


**Figure 2-1** Mounting the Switch in a Rack

# Connecting a Terminal to the Console Port

The console port is a serial RS-232 interface port that enables a connection to a terminal for performing switch monitoring and configuration functions. The terminal may be a PC or workstation running terminal emulation software, or a dumb terminal configured as a Data Terminal Equipment (DTE) connection. Alternatively, this port can be connected to an external modem to enable remote dial-in management. If you connect a terminal to the console port prior to powering the switch, you can observe the progress and results of the power-up diagnostics as the switch goes through its initialization process.

The console port connector is configured as a standard IBM AT connection using a male DB-9 (see Table A-1 for pinouts) connector. A standard null modem cable is typically all that is needed to connect to this interface. Any cable connected to the console port must be shielded to comply with emissions regulations and requirements.

**NOTE:** A null modem cable is not provided with the switch.

To connect the console port to a terminal, do the following:

1. Connect a terminal to the console port using a null modem interface cable (Figure 2-2).

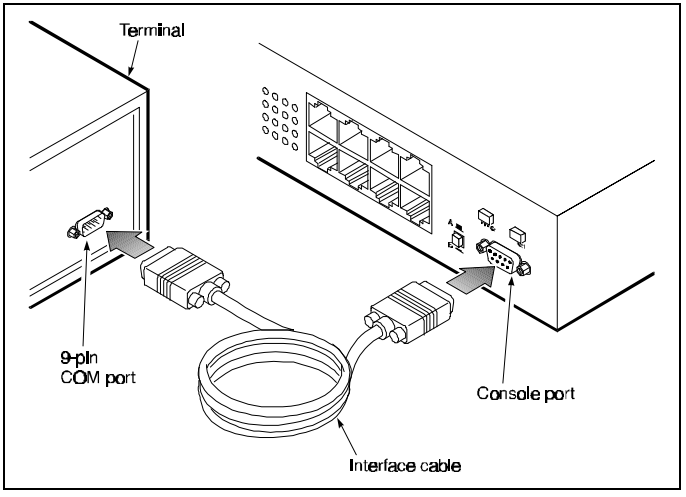



**Figure 2-2** Connecting a Terminal to the Console Port

2. Connect the interface cable directly to the console port on the switch and tighten the captive retaining screws.
3. Connect the other end of the interface cable to a terminal (in some instances, an adapter may be required to make this connection). You can also use a straight-through cable with a null modem adapter to make the connection to the workstation.
4. From your terminal, start the terminal emulation program.
5. Configure the terminal to the following communication settings:
   - 9600 baud
   - No parity
   - 8 data bits
   - 1 stop bit
   - No hardware flow control
   - ASCII character set

## Replacing an Installed Gigabit Ethernet Module into the Switch

The pre-installed modular Gigabit Interface Converter (GBIC) lets you add multimode and single mode fiber connections to the SW3324 switch. The GBIC module is installed in the modular slot on the left side of the switch.

To install the GBIC module in the switch, perform these steps:

1. If necessary, remove the existing GBIC connector by gently squeezing the sides to release it, and pull the GBIC out of the slot.
2. Holding the new or replacement GBIC by its sides, gently squeeze the plastic pieces located on the front sides of the connector.
3. Insert the GBIC module into the modular slot with the orientation arrows facing upward.
4. Slide the GBIC back into the slot until you hear it click.

**NOTE**: GBIC modules are hot plug compliant.

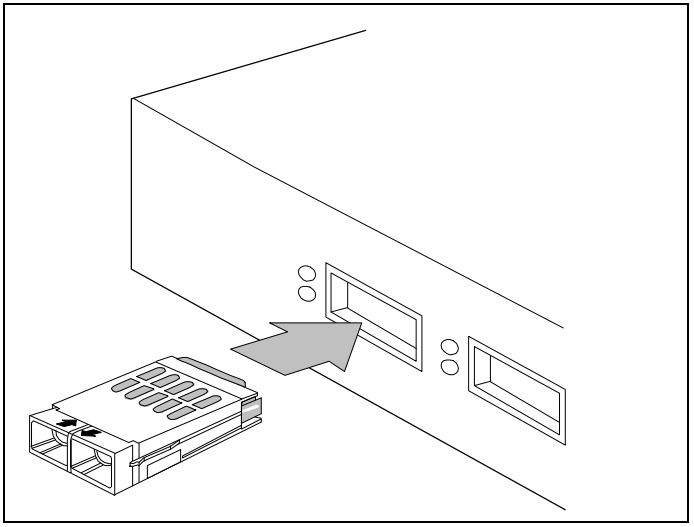


**Figure 2-3** GBIC Module Installation

## Powering the Switch

To supply power to the switch, do the following:

1. Connect the power cord to the switch and to a grounded three-prong wall outlet (Figure 2-4).

**WARNING:** To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord-grounding plug or use a three-to-two pronged adapter at the outlet. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Disconnect power from the unit by unplugging power cord from the electrical outlet or from the back of the unit.
- Do not place anything on power cords or cables. Arrange them so that no one can accidentally step on or trip over them. Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the plug and pull if from the outlet. Do not pull the plug out by the cord.

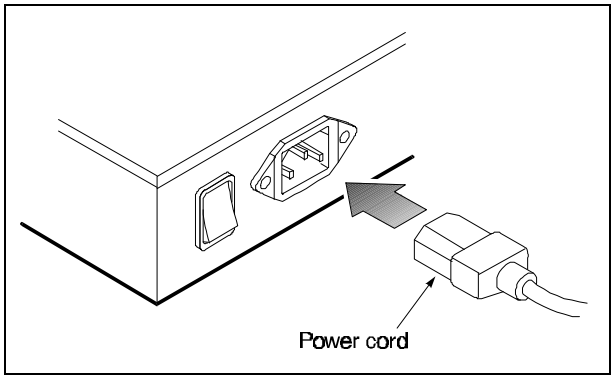



**Figure 2-4** Connecting the Power Cord to the Switch

2. Turn on the power switch.

The Power LED lights green (see Figure 1-1). If it does not, check to make sure that the power cable is plugged in correctly and that the power source is good.

## Power-Up

When you turn the power on, the switch conducts a series of hardware and software tests to verify correct operation. If a terminal or computer is connected to the console port, the results of the tests are displayed on the screen. If you want to display the results of the tests after the switch has already been turned on, turn the power switch off and then back on.

The switch performs two basic types of tests at power-up. During this time, the Test LED (see Figure 1-1) lights steady green. These tests are:

- Serial port

  The serial console port test is the first test performed. If the switch fails this test, no further tests are performed, and the console displays no information.

- Memory

  Memory tests on the CPU RAM are performed after the serial port test. No results are displayed on the console.

After these two tests are performed, the operational software of the switch is loaded. A series of more extensive diagnostic tests are then conducted during which the Test LED remains lit. The results of the tests are displayed on the terminal. If all tests pass, the Test LED turns off. When all tests are complete, the system is functional and the user interface is ready to receive commands at the console.

## RJ-45 Connector

The 10Base-T/100Base-TX ports use RJ-45 connectors. Figure 2-6 shows an RJ-45 connector being inserted into a port.

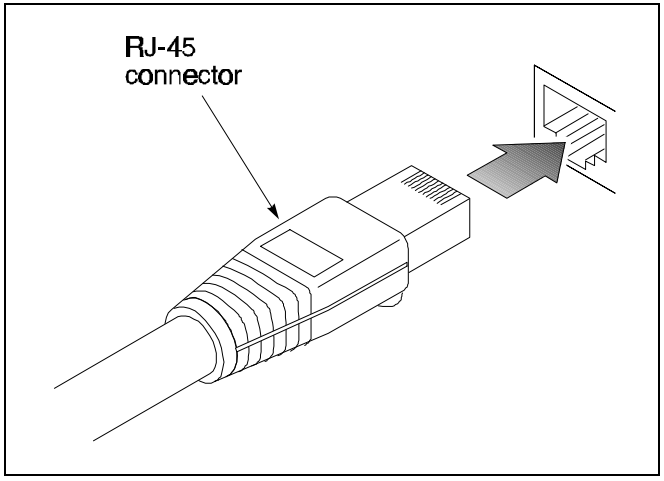



**Figure 2-6** Inserting an RJ-45 Connector into a Port

## Network Cable Requirements

Table 2-1 outlines specifications for copper cable.

**Table 2-1**
**Copper Cable Specifications**

| Interface Type | Cable Requirements | Maximum Length |
|---|---|---|
| 10Base-T | Category 3 or 5 Unshielded Twisted Pair (UTP) | 100m (328 ft.) |
| 100Base-Tx* | Category 5 UTP | 100m (328 ft.) |

*For connections to hubs or other switches, a crossover cable may be necessary. Refer to MDI/MDI-X "Crossover Cable Wiring" section in Appendix A, "Technical Specifications".

Table 2-2 outlines specifications for fiber cable.

**Table 2-2**
**Fiber Cable Specifications**

| Interface Type | Fiber Type | Fiber Diameter (microns) | Modal Bandwidth (MHz*km) | Maximum Length (m) |
|---|---|---|---|---|
| 100Base-FX | Multimode | 62.5 | | 412 |

Table 2-3 outlines specifications for gigabit ethernet cable.

**Table 2-3**
**Gigabit Ethernet Fiber Specifications**

| Interface Type | Fiber Type | Fiber Diameter (microns) | Modal Bandwidth (MHz*km) | Maximum Length (m) |
|---|---|---|---|---|
| 1000Base-SX | Multimode | 62.5 | 160 | 220 |
| | Multimode | 62.5 | 200 | 275 |
| | Multimode | 50 | 400 | 500 |
| | Multimode | 50 | 500 | 550 |
| 1000Base-LX | Multimode | 62.5 | 500 | 550 |
| | Multimode | 50 | 400 | 550 |
| | Multimode | 50 | 500 | 550 |
| | Single-mode | 10 | N/A | 5000 |

## 1000Base-SX/LX Ports

The 1000Base-SX/LX ports use identical SC fiber connectors and multimode 62.5/125µm fiber. The Gigabit Ethernet ports support IEEE 802.3z Gigabit Ethernet through the use of modular Gigabit Interface Converters (GBICs). Supported media includes multimode fiber and single mode fiber.

# *Chapter 3*
# SW3322/SW3323/SW3324 User Interface

## Overview

When you have connected a terminal to the console port, or used Telnet to access the switch over the network, you can gain access to the console menus. These menus allow you to reconfigure the switch from its factory default settings, as well as to monitor switch status and performance. The menus have a layout similar to the sample Main Menu shown in Figure 3-1. The information is divided into the following parts:

- Menu Identification (includes model number and software version level)
- Menu Name (includes access privileges)
- Selectable Items listed by letters
- Screen Prompt for menu selections and entry of field parameters, and Message Area for display of next entry option, parameters, or error messages.

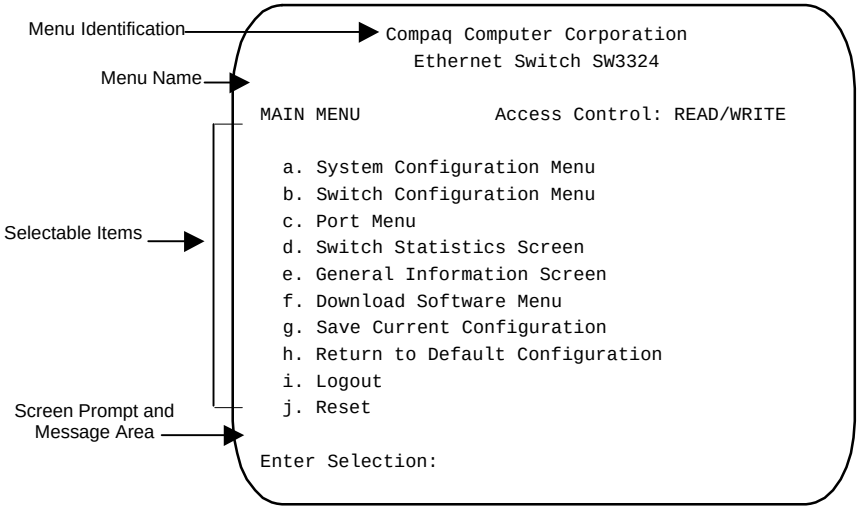



**Figure 3-1** Sample Main Menu

## User Access

There are two modes of access to the user interface: READ-ONLY and READ/WRITE. READ-ONLY access allows you to view switch information, but not modify any operating parameters. READ/WRITE access allows you to both read and modify switch information. You are required to login with a password before obtaining READ/WRITE access. The factory default password is “public” (lower case), allowing full READ/WRITE access until a new password is set.

To use the console menus, do the following:

1. Type the letter associated with the desired option.

   If the selected item is a submenu title, the submenu is displayed when you enter the letter.
2. Enter the parameter requested by the screen prompt.

   If the selected item is a parameter, the system displays a prompt for the entry of a new parameter value. If the value entered is invalid, a beep sounds, or a message displays, requesting you to enter a valid value.

## Factory Defaults

Table 3-1 lists the factory default settings for the switch configuration parameters. Each of these parameters can be changed via the console menus or Telnet.

**Table 3-1**
**Factory Default Settings**

| Parameter | Default Value |
|---|---|
| Active Aging Time | 300 |
| Auto-negotiation Enable | Yes |
| Broadcast Cutoff Rate | 500000 |
| BootP/DHCP Enable | Yes |
| Bridge Priority | 32768 |
| Class of Service Enable | No |
| Class of Service Port Priority | 0 |
| Class of Service Priority Threshold | 4 |
| Flow Control Enable (Terminal) | No |
| Forward Delay (Seconds) | 15 |
| Full Duplex | Yes |
| Hello Time (Seconds) | 2 |
| Max Age (Seconds) | 20 |
| Password | public |
| Path Cost | 1 for 1000 Mbps speed ports<br>10 for 100Mbps speed ports<br>100 for 10Mbps speed ports |
| Port Enable | Yes |
| Port Priority | 128 |
| Port Speed | 100 |
| Port Mirroring Enable | No |
| Screen Timeout (Minutes) | 5 |
| SNMP Private Community Name | private |
| SNMP Public Community Name | public |
| Spanning Tree Protocol Enable | No |
| Terminal Baud Rate | 9600 |
| VLAN Enable | No |
| VLAN Port Type | Access |

# Menu Hierarchy

Figure 3-2 shows the SW3322/SW3323/SW3324 switch user interface menu hierarchy.

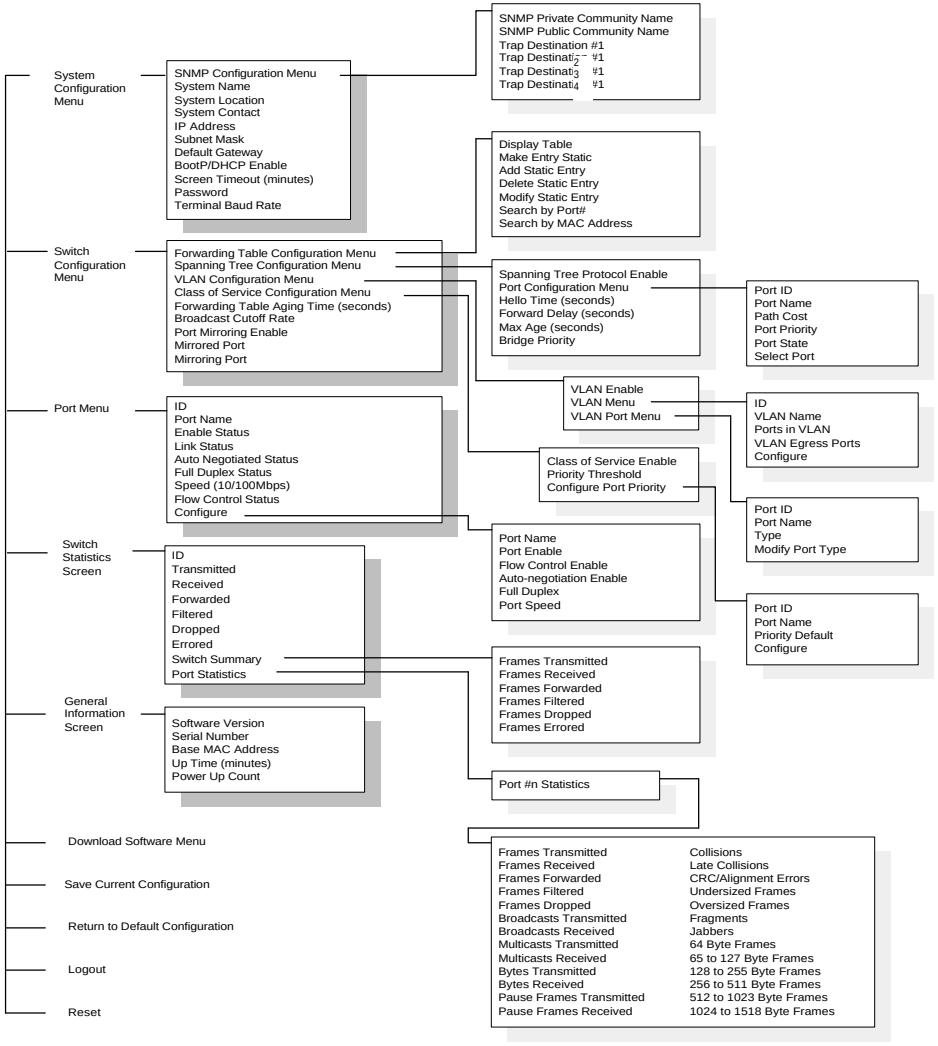



**Figure 3-2** SW3322/SW3323/SW3324 User Interface Menu Hierarchy

# Main Menu

The Main Menu is the first screen seen after successfully logging in to the system. Figure 3-3 shows the Main Menu and Table 3-2 describes the menu.

```
MAIN MENU      Access Control: READ/WRITE

  a. System Configuration Menu
  b. Switch Configuration Menu
  c. Port Menu
  d. Switch Statistics Screen
  e. General Information Screen
  f. Download Software Menu
  g. Save Current Configuration
  h. Return to Default Configuration
  i. Logout
  j. Reset

Enter Selection:
```

**Figure 3-3** Main Menu

**Table 3-2**
**Main Menu Descriptions**

| Selection | Description |
|---|---|
| System Configuration Menu | Contains commands and parameters that reflect the global operation of the switch. |
| Switch Configuration Menu | Provides access to information and parameters affecting the functional operation of the switch. You can configure items such as Forwarding Table, Spanning Tree, and virtual LAN (VLAN) parameters. |
| Port Menu | Shows the configuration of the individual ports on the switch and allows you to modify switch port operation. |
| Switch Statistics Screen | Presents switch-level and port-level statistics. |
| General Information Screen | Displays the system software version, serial number of the switch, base MAC address, system up time and power-up count. |
| Download Software Menu | Contains parameters and commands for initiating a software download to the switch to upgrade the switch operating software. |
| Save Current Configuration | Saves the current switch operating parameters to non-volatile memory. |
| Return to Default Configuration | Restores switch operating parameters to their factory defaults. You must reset the switch for the default parameters to take effect. |
| Logout | Logs out of the console interface. Once you logout, you must enter a password before you can access the console interface again. |
| Reset | Performs a software reset of the switch by restarting the system software and reloading all operating parameters. |

# System Configuration Menu

The System Configuration Menu enables modification of system-level switch configuration parameters. Select **a** from the Main Menu to view the System Configuration Menu. Figure 3-4 shows the System Configuration Menu and Table 3-3 describes the menu.

```
SYSTEM CONFIGURATION     Access Control:READ/WRITE

  a. SNMP Configuration Menu
  b. System Name
  c. System Location
  d. System Contact
  e. IP Address000.000.000.000
  f. Subnet Mask000.000.000.000
  g. Default Gateway000.000.000.000
  h. BootP/DHCP EnableYes
  i. Screen Timeout(minutes)5
  j. PasswordNone
  k. Terminal Baud Rate9600
  l. Terminal Hardware Flow Control No
  m. Power Up Diagnostics  Yes

  x. Previous Menu

Enter Selection:
```

**Figure 3-4** System Configuration Menu

**Table 3-3**
**System Configuration Menu Descriptions**

| Selection | Description |
|---|---|
| SNMP Configuration Menu | Menu for configuring a number of SNMP-related parameters. |
| System Name | The administrative name given to the switch (1-36 character range). |
| System Location | The physical location of the switch (1-36 character range). |
| System Contact | The contact person for the operation of the switch (1-36 character range). |
| IP Address | The IP address of the switch. |
| Subnet Mask | The subnet mask associated with the IP address of the switch. |
| Default Gateway | The default gateway (or router) that the switch sends IP packets destined for a different subnet. |
| BootP/DHCP Enable | Allows you to enable (Yes) or disable (No) the BootP and DHCP protocols for automatically configuring the switch's IP address information. |

*continued*

*System Configuration Menu Descriptions continued*

| Selection | Description |
|---|---|
| Power Up Diagnostics | Allow you to enable (Yes) or disable (No) Diagnostics at power-up. Default is Diagnostics enabled. |
| Screen Timeout (minutes) | The duration of time before a serial console or Telnet session terminates due to user inactivity (0-65535 numeric range). A value of "0" means that the screen will not terminate at any time. |
| Password | Password allowing "read/write" access to the user interface, either via the serial console or Telnet (1-10 character range). |
| Terminal Baud Rate | The baud rate of the serial console interface (2400, 9600 or 19200). |
| Previous Menu | Returns you to the previous menu. |

# SNMP Configuration Menu

The SNMP Configuration Menu allows you to modify SNMP-related configuration parameters. Select **a** from the System Configuration Menu to view the SNMP Configuration Menu. Figure 3-5 shows the SNMP Configuration Menu.

```
SNMP CONFIGURATION     Access Control: READ/WRITE

    a.  SNMP Private Community Nameprivate
    b.  SNMP Public Community Namepublic
    c.  Trap Destination #1       000.000.000.000
    d.  Community Name #1
    e.  Trap Destination #2       000.000.000.000
    f.  Community Name #2
    g.  Trap Destination #3       000.000.000.000
    h.  Community Name #3
    i.  Trap Destination #4       000.000.000.000
    j.  Community Name #4

    x.  Previous Menu

  Enter Selection:
```

**Figure 3-5** SNMP Configuration Menu

Table 3-4 describes the SNMP Configuration Menu.

**Table 3-4**
**SNMP Configuration Menu Descriptions**

| Selection | Description |
|---|---|
| SNMP Private Community Name | The community name for read/write SNMP access to the device (1-10 character range; the default name is: “private”). |
| SNMP Public Community Name | The community name for read only SNMP access to the device (1-10 character range; the default name is: “public”). |
| Trap Destination #1 | The IP address of trap destination #1 where SNMP trap messages are forwarded. |
| Trap Destination #2 | The IP address of trap destination #2 where SNMP trap messages are forwarded. |
| Trap Destination #3 | The IP address of trap destination #3 where SNMP trap messages are forwarded. |
| Trap Destination #4 | The IP address of trap destination #4 where SNMP trap messages are forwarded. |

# Switch Configuration Menu

The Switch Configuration Menu allows you to modify switching-related configuration parameters. Select **b** from the Main Menu to view the Switch Configuration Menu. Figure 3-6 shows the Switch Configuration Menu.

```
SWITCH CONFIGURATION   Access Control: READ/WRITE

 a. Forwarding Table Configuration Menu
 b. Spanning Tree Configuration Menu
 c. VLAN Configuration Menu
 d. Forwarding Table Aging Time(seconds)       300
 e. Broadcast Cutoff Rate                   500000
 f. Port Mirroring Enable                   No
 g. Mirrored Port                           2
 h. Mirroring Port                          1
 i. Transmit Data Mirroring Enable          Yes
 j. Receive Data Mirror Enable              No
 k. Class of Service Configuration Menu

 x. Previous Menu

Enter Selection:
```

**Figure 3-6** SNMP Configuration Menu

Table 3-5 describes the Switch Configuration Menu.

**Table 3-5**
**Switch Configuration Menu Descriptions**

| Selection | Description |
|---|---|
| Forwarding Table Configuration Menu | Menu for configuring the switch forwarding table. |
| Spanning Tree Configuration Menu | Menus for configuring the switch Spanning Tree operation. |
| VLAN Configuration Menu | Menu for configuring the VLAN operation of the switch. |
| Forwarding Table Aging Time | Time in seconds until entries in the filter table are aged out if not accessed (10-1,000,000 second range). |
| Broadcast Cutoff Rate | Per second rate past which broadcast and destination unknown frames are not flooded through the switch to help alleviate broadcast storms (100-500,000 frames per second range). A value of 0 disables this function. |
| Port Mirroring Enable | Allows you to enable (Yes) or disable (No) port mirroring. |
| Mirrored Port | The source port for the data to be mirrored. |
| Mirroring Port | The destination port for the data to be mirrored. |
| Class of Service Configuration Menu | Menu for configuring Class of Service for the switch. |
| Transmit Data Mirroring Enable | Allows enable/disable port transmit data mirroring |
| Receive Data Mirror Enable | Allows enable/disable port receive data mirroring |

# Forwarding Table Configuration Menu

The Forwarding Table Configuration Menu allows you to view and modify forwarding table parameters. Select **a** from the Switch Configuration Menu to view the Forwarding Table Configuration Menu. Figure 3-7 shows the Forwarding Table Configuration Menu and Table 3-6 describes the Menu.

```
FORWARDING TABLE CONFIGURATION          Access Control: READ/WRITE

MAC ADDRESS      TYPE       DISPOSITION      PORT ID      PORT NAME
-------------------------------------------------------------------
 0a0a0a0a0a0a    DYNAMIC       FORWARD           1
 0a0a0a0a0a0b    DYNAMIC       FORWARD           2
 0a0a0a0a0a0c    DYNAMIC       FORWARD           3
 0a0a0a0a0a0d    DYNAMIC       FORWARD           4
 0a0a0a0a0a0e    DYNAMIC       FORWARD           5
 0a0a0a0a0a0f    DYNAMIC       FORWARD           6
 0a0a0a0a0a10    DYNAMIC       FORWARD           7
 0a0a0a0a0a11    DYNAMIC       FORWARD           8

 n. Next Page    p. Previous Page    f. First Page    l. Last Page

 a. Display Table     b. Make Entry Static
 c. Add Static Entry  d. Delete Static Entry   e. Modify Static Entry
 s. Search by Port #  m. Search by MAC Address x. Previous Menu

Enter Selection:
```

**Figure 3-7** Forwarding Table Configuration Menu

**Table 3-6**
**Forwarding Table Configuration Menu Descriptions**

| Field | Description |
|---|---|
| MAC Address | MAC address for the listed port. |
| Type | Displays the type of address entry: system, dynamic or static. |
| Disposition | Displays the disposition of the address entry: local, forward or discard. |
| Port # | Displays the port number associated with the MAC address entry. |
| Port Name | Displays the administrative name assigned to the port. |
| Next Page | Displays the next page of the forwarding table. |
| Previous Page | Displays the previous page of the forwarding table. |
| First Page | Displays the first page (top) of the forwarding table. |

*continued*

*Forwarding Table Configuration Menu Descriptions continued*

| Field | Description |
|---|---|
| Last Page | Displays the last page of the forwarding table. |
| Display Table | Redisplays the forwarding table. |
| Make Entry Static | Makes a dynamic entry in the forwarding table static. |
| Add Static Entry | Adds a static entry to the forwarding table. |
| Delete Static Entry | Deletes a static entry from the forwarding table. |
| Modify Static Entry | Modifies a static entry from the forwarding table. |
| Search by Port # | Performs a search by port number and posts the search results at the top of the screen. |
| Search by MAC Address | Performs a search by MAC Address and posts the search results at the top of the screen. |
| Port ID | Displays unique identification number of the port. |

# Spanning Tree Configuration Menu

The Spanning Tree Configuration Menu allows you to view and modify Spanning Tree parameters. Select **b** from the Switch Configuration Menu to view the Spanning Tree Configuration Menu. A letter identifies selections that can be modified. All other fields are read-only. Figure 3-8 shows the Spanning Tree Configuration Menu.

```
SPANNING TREE CONFIGURATION      Access Control: READ/WRITE

     Bridge ID                      32768-000000000000
     Designated Root
     Root Path Cost                 0
     Root Port                      NO PORT
     Topology Change Count          0

  a. Spanning Tree Protocol Enable  No
  b. Port Configuration Menu
  c. Hello Time (seconds)           2
  d. Forward Delay (seconds)        15
  e. Max Age (seconds)              20
  f. Bridge Priority                32768

  x. Previous Menu

Enter Selection:
```

**Figure 3-8** Spanning Tree Configuration Menu

Table 3-7 describes the Spanning Tree Configuration Menu.

**Table 3-7**
**Spanning Tree Configuration Menu Descriptions**

| Field | Description |
|---|---|
| Bridge ID | A unique identifier for the bridge (switch) in the Spanning Tree. The ID is a combination of the bridge priority and port 1 MAC address. |
| Designated Root | The bridge in the Spanning Tree with the lowest Bridge ID value, designated as the root bridge. |
| Root Path Cost | The cost of the path to the root bridge. |
| Root Port | The port identifier of the port that offers the lowest cost path to the root bridge. |
| Topology Change Count | The number of times the network topology has changed from a Spanning Tree reconfiguration. |
| Spanning Tree Protocol Enable | Allows you to enable (Yes) or disable (No) the global Spanning Tree operation on the switch. |
| Port Configuration Menu | Provides access to the Spanning Tree Port Configuration Menu. |
| Hello Time (seconds) | The time interval between the sending of Configuration BPDUs by the bridge, if it is root (1-10 second range). |
| Forward Delay (seconds) | The delay before a port transfers into the forwarding state, if it is root (4-30 second range). |
| Max Age (seconds) | The maximum age of received protocol information before it is discarded (6-40 second range). |
| Bridge Priority | A relative priority of bridges, with the lowest value bridge ID indicating the highest priority (0-65535 ) |

# Spanning Tree Port Configuration Menu

The Spanning Tree Port Configuration Menu allows you to view Spanning Tree Configuration information for all of the ports in a table format. Select **b** from the Spanning Tree Configuration Menu to view the Spanning Tree Port Configuration Menu.

Figure 3-9 shows the Spanning Tree Port Configuration Menu and Table 3-8 describes the menu. .

```
SPANNING TREE PORT CONFIGURATION              Access Control: READ/WRITE

 PORT ID     PORT NAME       PATH COST      PORT PRIORITY     PORT STATE
-------------------------------------------------------------------------
    1                            10              128             FORWARDING
    2                            10              128             FORWARDING
    3                            10              128             FORWARDING
    4                            10              128             FORWARDING
    5                            10              128             FORWARDING
    6                            10              128             FORWARDING
    7                            10              128             FORWARDING
    8                            10              128             FORWARDING
    9                            10              128             FORWARDING
   10                            10              128             FORWARDING

  n. Next Page    p. Previous Page    f. First Page    l. Last Page

  a. Select Port    x. Previous Menu

Enter Selection:
```

**Figure 3-9** Spanning Tree Port Configuration Menu Selections

**Table 3-8**
**Spanning Tree Port Configuration Descriptions**

| Field | Description |
|---|---|
| Port ID | A unique identifier for a port on the bridge (switch). |
| Port Name | The administrative name assigned to the port. |
| Path Cost | The contribution of the path through this port, when it is the root port, to the total path cost from this bridge to the root bridge. 10 for 100Mbps ports, 100 for 10Mbps ports. |
| Port Priority | The relative priority of the port on the bridge. |
| Port State | The current Spanning Tree state of the port on the bridge, either disabled, listening, learning, forwarding, or blocking. |
| Next Page | Displays the next page of the table. |
| Previous Page | Displays the previous page of the table. |
| First Page | Displays the first page (top) of the table. |
| Last Page | Displays the last page of the table. |
| Select Port | Allows you to enter a port number to view and modify port parameters in the Spanning Tree Port #n Configuration Menu. |

# Spanning Tree Port #*n* Configuration Menu

The Spanning Tree Port #n Configuration Menu allows you to view Spanning Tree Port Configuration information for an individual port. Select **a** from the Spanning Tree Port Configuration Menu, enter a port number, and press Enter to view the Spanning Tree Port #*n* Configuration Menu. Figure 3-10 shows the Spanning Tree Port #*n* Configuration Menu and Table 3-9 describes the menu. The "Port #*n*" designation represents the specific port number for configuration.

```
                                    SPANNING TREE PORT #1
CONFIGURATION      Access Control: READ/WRITE

                                Port State       DISABLED
                                MAC Address      000000000000
                                Designated Cost  0
                                Designated Port  0
                                Designated Root  0000-000000000000
                                Designated Bridge0000-000000000000

                                a. Path Cost     10
                                b. Path Priority 255


x. Previous Menu
```

**Figure 3-10** Spanning Tree Port #n Configuration Menu

**Table 3-9**
**Spanning Tree Port #n Configuration Menu Descriptions**

| Field | Description |
|---|---|
| Port State | The current Spanning Tree state of the port, either disabled, listening, learning, forwarding, or blocking. |
| MAC Address | The MAC address of the port. |
| Designated Cost | The cost of the path to the Root offered by the designated port for the LAN associated with the port. |
| Designated Port | The ID of the port believed to be the designated port for the LAN associated with the port. |
| Designated Root | The ID of the bridge recorded as the Root for the LAN associated with the port. |
| Designated Bridge | The ID of the bridge believed to be the designated bridge for the LAN associated with the port. |
| Path Cost | The contribution of the path through this port, when it is the root port, to the total path cost from this bridge to the root bridge (1-65535 range). |
| Port Priority<br>Path Priority | The relative priority of the port on the bridge (0-255 range).<br>(0-255 range) |

# VLAN Configuration Menu

The VLAN Configuration Menu allows you to configure the operation of all virtual LANs (VLANs) in the switch. You can configure up to 4094 VLANs per switch. Select **c** from the Switch Configuration Menu to view the VLAN Configuration Menu. Figure 3-11 shows the VLAN Configuration Menu and Table 3-10 describes the VLAN Configuration Menu. See Appendix C, "Virtual LANs (VLANs)" for more information about this feature.

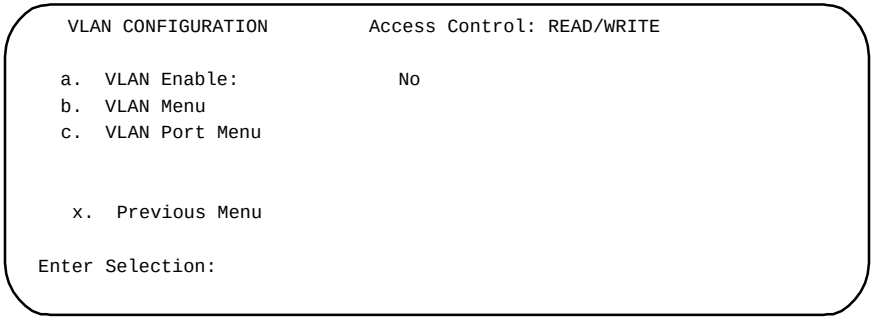



**Figure 3-11** VLAN Configuration Menu

**Table 3-10**
**VLAN Configuration Menu Descriptions**

| Selection | Description |
|---|---|
| VLAN Enable | Allows you to enable (Yes) or disable (No) the global VLAN operation of the switch. |
| VLAN Menu | Allows you to open the VLAN Menu. |
| VLAN Port Menu | Menu for configuring VLAN information per port. |

# VLAN Menu

The VLAN Menu allows you to view individual VLAN names and go to the VLAN #n Configuration Menu to configure the number of ports in the VLAN. Select **b** from the VLAN Configuration Menu to view the VLAN Menu. Figure 3-12 shows the VLAN Menu and Table 3-11 describes the VLAN Menu.

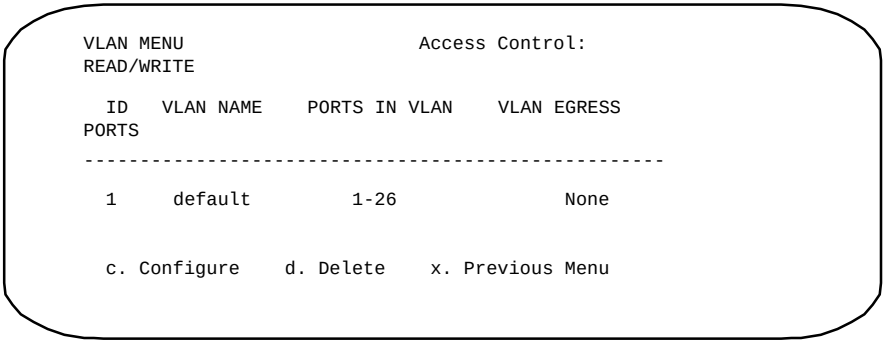

VLAN MENU Access Control:
READ/WRITE
ID VLAN NAME PORTS IN VLAN VLAN EGRESS
PORTS
1 default 1-26 None
c. Configure d. Delete x. Previous Menu

**Figure 3-12** VLAN Menu

**Table 3-11**
**VLAN Menu Descriptions**

| Field | Description |
|---|---|
| VLAN ID | The identification number of the VLAN (1-4 character range). |
| VLAN Name | The administrative name assigned to the VLAN (1-14 character range; entering a VLAN name is not required). |
| Ports in VLAN | The ports assigned to the VLAN. The maximum number of VLANs is 4094 per switch. |
| VLAN Egress Ports | The egress (exit) ports which link the switch to other devices which also include members of the same VLAN. |
| Configure | Allows you to configure an existing VLAN listed in the VLAN table, create a new VLAN (1-4094 numerical range), and to open the VLAN #n Configuration Menu. |
| Delete | Allows you to delete a specific VLAN. |

# VLAN #n Configuration Menu

The VLAN #n Configuration Menu allows you to configure the VLAN Port Name for a specific port, add or remove a port in the VLAN, and add or remove a VLAN egress port. Select **c** from the VLAN Menu, enter a port number, and press Enter to view the VLAN #n Configuration Menu. Figure 3-13 shows the VLAN #n Configuration Menu and Table 3-12 describes the VLAN #n Configuration Menu.

**NOTE:** The designation "#n" represents the number of the specific VLAN to be configured.

```
VLAN #n CONFIGURATION              Access Control:
READ/WRITE

   Ports in VLAN              1-26
   VLAN Egress Ports          None

a. VLAN Name                  default
b. Add Port in VLAN
c. Remove Port In VLAN
d. Add VLAN Egress Port
e. Remove VLAN Egress Port

x. Previous Menu

Enter Selection:
```

**Figure 3-13** VLAN Configuration #n Menu

**Table 3-12**
**VLAN Configuration #n Menu Descriptions**

| Field | Description |
|---|---|
| Ports in VLAN | Lists the number of ports in the specific VLAN. |
| VLAN Egress Ports | Lists the number of VLAN Egress Ports in the specific VLAN. |
| VLAN Name | Allows you to enter an administrative name for the VLAN (1-14 character range; entering a VLAN name is not required). |
| Add Port in VLAN | Allows you to enter a port in the VLAN. |
| Remove Port in VLAN | Allows you to remove a port in the VLAN. |
| Add VLAN Egress Port | Allows you to add a VLAN Egress Port. |
| Remove VLAN Egress Port | Allows you to remove a VLAN Egress Port. |

**NOTE:** Once ports are configured as part of a custom VLAN, they will be moved to that selected VLAN, and removed from their previous VLAN.

# VLAN Port Menu

The VLAN Port Menu displays a table of VLAN configuration information on a per port basis and allows you to modify the VLAN Port Type. Select **c** from the VLAN Configuration Menu to view the VLAN Port Menu. Figure 3-14 shows the VLAN Port Menu and Table 3-13 describes the Port Menu.

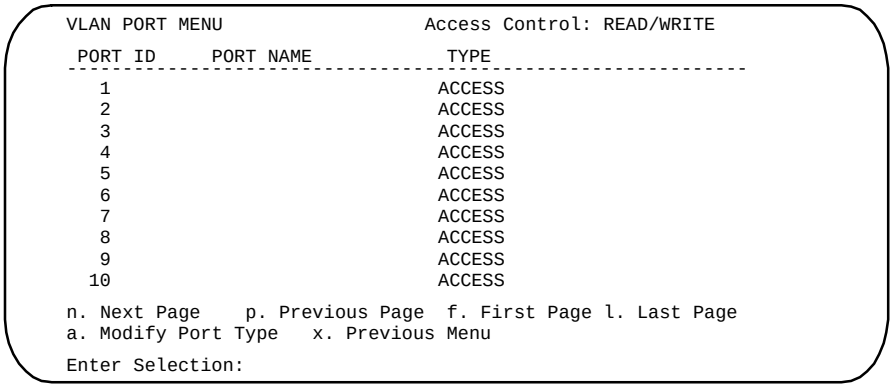



**Figure 3-14** VLAN Port Menu

**Table 3-13**
**VLAN Port Menu Descriptions**

| Field | Description |
|---|---|
| Port ID | The port number. |
| Port Name | The administrative name assigned to the port. |
| Type | The VLAN type for each port, either hybrid or access. Hybrid ports accept tagged and non-tagged frames while access ports only allow non-tagged frames. |
| Next Page | Displays the next page of the table. |
| Previous Page | Displays the previous page of the table. |
| First Page | Displays the first page of the table. |
| Last Page | Displays the last page of the table. |
| Modify Port Type | Allows you to modify the port type (either Hybrid or Access). |

# Class of Service Configuration Menu

The Class of Service Configuration Menu allows you to configure Class of Service settings for the system as well as to set the Class of Service for VLAN tagged frames. Select **k** from the Switch Configuration Menu to view the Class of Service Configuration Menu. Figure 3-15 shows the Class of Service Configuration Menu and Table 3-14 describes the menu.

```
CLASS OF SERVICE CONFIGURATION MENU     Access Control: READ/WRITE

  a.  Class of Service Enable              No
  b.  Priority Threshold                   4
  c.  Configure Port Priority

  x.  Previous Menu

Enter Selection:
```

**Figure 3-15** Class of Service Configuration Menu

**Table 3-14**
**Class of Service Configuration Menu Descriptions**

| Selection | Description |
|---|---|
| Class of Service Enable | Allows you to enable (Yes) or disable (No) Class of Service operation for the system. |
| Priority Threshold | Allows you to enter the global priority threshold level. The configurable range is 0-7 (0=low, 7=high).<br><br>VLAN tagged frames with a high priority level below this threshold level will be assigned normal priority level through the switch.<br><br>VLAN tagged frames with a priority level equal to or greater than this threshold level will be assigned high priority through the switch. |
| Configure Port Priority | Allows you to open the Port Priority Menu for configuring Class of Service information per port. |

# Port Priority Menu

The Port Priority Menu allows you to modify and display a table that shows priority queuing configuration information on a per port basis. Select **c** from the Class of Service Configuration Menu to view the Port Priority Configuration Menu. Figure 3-16 shows the Port Priority Configuration Menu and Table 3-15 describes the menu.

```
PORT PRIORITY                  Access Control:
READ/WRITE

 PORT ID    PORT NAME          PRIORITY DEFAULT
-----------------------------------------------------
--------
    1                                  0
    2                                  0
    3                                  0
    4                                  0
    5                                  0
    6                                  0
    7                                  0
    8                                  0
    9                                  0
   10                                  0

n. Next Page   p. Previous Page  f. First Page  l.
Last Page
c. Configure   x. Previous Menu

Enter Selection:
```

**Figure 3-16** Port Priority Configuration Menu

**Table 3-15**
**Port Priority Configuration Menu Descriptions**

| Field | Description |
|---|---|
| Port ID | The port number assigned to the port. |
| Port Name | The administrative name assigned to the port. |
| Priority Default | The priority level assigned to non-tagged frames entering the associated port. The configurable range is 0-7 (0=low, 7=high). This value, combined with the Priority Threshold Value, determines the priority level assigned to all non-tagged frames. |
| Next Page | Displays the next page of the table. |
| Previous Page | Displays the previous page of the table. |
| First Page | Displays the first page of the table. |
| Last Page | Displays the last page of the table. |
| Configure | Allows you to configure the priority default for a specific port (0-7 number range). |

# Port Menu

The Port Menu allows you to display information for each port in a table format, as well as to access the Port Configuration Menu. You can also refresh the information appearing on the screen. Select **c** from the Main Menu to view the Port Menu. Figure 3-17 shows the Port Menu and Table 3-16 describes the menu.

```
PORT MENU                              Access Control: READ/WRITE

                              LINK          AUTO    FULL                 FLOW
ID PORT NAME    ENABLED     STATUS      NEGOTIATED DUPLEX SPEED TYPE   CONTROL
-------------------------------------------------------------------------------
1                  Yes    DISCONNECTED      No       Yes    100 100TX     No
2                  Yes    DISCONNECTED      No       Yes    100 100TX     No
3                  Yes    DISCONNECTED      No       Yes    100 100TX     No
4                  Yes    DISCONNECTED      No       Yes    100 100TX     No
5                  Yes    DISCONNECTED      No       Yes    100 100TX     No
6                  Yes    DISCONNECTED      No       Yes    100 100TX     No
7                  Yes    DISCONNECTED      No       Yes    100 100TX     No
8                  Yes    DISCONNECTED      No       Yes    100 100TX     No
9                  Yes    DISCONNECTED      No       Yes    100 100TX     No
10                 Yes    DISCONNECTED      No       Yes    100 100TX     No
11                 Yes    DISCONNECTED      No       Yes    100 100TX     No
12                 Yes    DISCONNECTED      No       Yes    100 100TX*    No

  n. Next Page  p. Previous Page  f. First Page  l. Last Page

  r. Refresh    c. Configure      x. Previous Menu

Enter Selection:
```

**Figure 3-17** Port Menu

**NOTE**: Default is 100TX for 1-24 and 1000SX for 25-26.

Table 3-16 describes the the Port Menu

**Table 3-16**
**Port Menu Descriptions**

| Field | Description |
|---|---|
| ID | The port identification number. |
| Port Name | The administrative name assigned to the port (1-14 character range). |
| Enabled | The current "enabled" state of the port, either "Yes" or "No." |
| Link Status | The current link state of the port, either "connected" or "disconnected." |
| Auto Negotiated | The current state of auto-negotiation, whether or not auto-negotiation is complete, "Yes" or "No" |
| Full Duplex | The current full duplex state of the port, either "Yes" or "No." |
| Speed | The current speed of the port, either 10Mbps or 100Mbps. |
| Flow Control | The current enable/disable state of flow control on the port, either "Yes" or "No." |
| Next Page, Previous Page, First Page, Last Page | Display the selected page of the table. |
| Refresh | Refreshes the screen to reflect latest system conditions. |
| Configure | Enter a port number and to open the Port Configuration Menu to configure a specific port. |

# Port Configuration Menu

The Port Configuration Menu allows you to configure port settings for a specific port. Select **c** from the Port Menu, enter a port number, and press Enter to view the Port Configuration Menu. Figure 3-18 shows the Port Configuration Menu and Table 3-17 describes the menu.

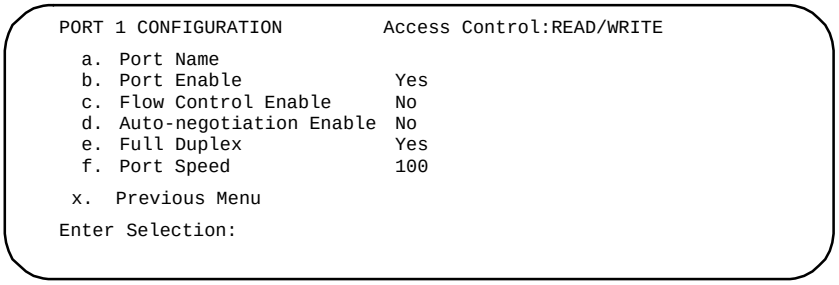



**Figure 3-18** Port Configuration Menu

**Table 3-17**
**Port Configuration Menu Descriptions**

| Selection | Description |
|---|---|
| Port Name | Allows you to assign an administrative name to the port (1-14 character range). |
| Port Enable | Allows you to enable (Yes) or disable (No) the port. |
| Flow Control Enable | Allows you to enable (Yes) or disable (No) flow control on the port. |
| Auto-negotiation Enable | Allows you to enable (Yes) or disable (No) the auto-negotiation mode for the port.<br>If Auto-negotiation Enable is set to No, the Full Duplex and Port Speed fields display and are eligible for configuration.<br>If Auto-negotiation Enable is set to Yes, the Full Duplex and Port Speed fields disappear and the system automatically manages these functions. |
| Full Duplex | Allows you to enable (Yes) or disable (No) the full duplex mode for the port. |
| Port Speed | Allows you to set the speed (10 or 100Mbps) for the port. |

## Switch Statistics Screen

The Switch Statistics Screen provides a summary display of port-level statistics, and provides access to the Port Statistics screens. You can also clear or refresh the statistics. Select **d** from the Main Menu to view the Switch Statistics Screen. Figure 3-19 shows the Switch Statistics Screen and Table 3-18 describes the screen.

```
SWITCH STATISTICS                              Access Control: READ/WRITE

ID   TRANSMITTED    RECEIVED   FORWARDED  FILTERED     DROPPED
ERRORED
-------------------------------------------------------------------------
-
1         0            0            0          0            0           0
2         0            0            0          0            0           0
3         0            0            0          0            0           0
4         0            0            0          0            0           0
5         0            0            0          0            0           0
6         0            0            0          0            0           0
7         0            0            0          0            0           0
8         0            0            0          0            0           0
9         0            0            0          0            0           0
10        0            0            0          0            0           0

  n. Next Page    p. Previous Page    f. First Page    l. Last Page

  s. Switch Summary         d. Port Statistics
  r. Refresh     c. Clear      x. Previous Menu

Enter Selection:
```

**Figure 3-19** Switch Statistics Screen

Table 3-18 describes the Switch Statistics Screen

**Table 3-18**
**Switch Statistics Screen Descriptions**

| Field | Description |
|---|---|
| ID | The port identification number. |
| Transmitted | Number of frames transmitted out the port. |
| Received | Number of frames received on the port. |
| Forwarded | Number of frames forwarded through the port. |
| Filtered | Number of frames filtered on the port. |
| Dropped | Number of frames received that were dropped by the switch due to lack of resources. |
| Errored | Number of errored frames received on the port. |
| Next Page, Previous Page, First Page, Last Page | Display the selected page of the table. |
| Switch Summary | Allows you to open the Switch Summary Screen. |
| Port Statistics | Allows you to open the Port Statistics Screen. |
| Refresh | Refreshes switch statistics. |
| Clear | Clears (or sets to zero) switch statistics. |

## Switch Summary Screen

The Switch Summary Screen allows you to display sum total statistics for all ports of the switch. You can also clear or refresh the statistics. Select **s** from the Switch Statistics Screen to view the Switch Summary screen. Figure 3-20 shows the Switch Summary Screen and Table 3-19 describes the screen.

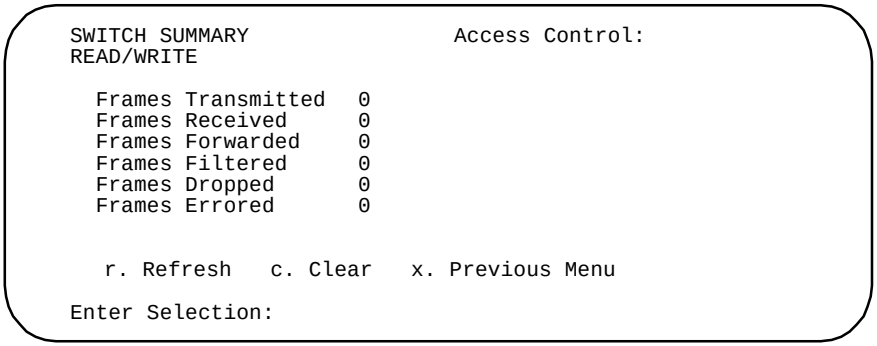



**Figure 3-20** Switch Summary Screen

**Table 3-19**
**Switch Summary Screen Descriptions**

| Field | Description |
|---|---|
| Frames Transmitted | Total number of frames transmitted out all ports. |
| Frames Received | Total number of frames received on all ports. |
| Frames Forwarded | Total number of frames forwarded through the switch. |
| Frames Filtered | Total number of frames filtered on all ports. |
| Frames Dropped | Total number of frames dropped by the switch due to lack of resources. |
| Frames Errored | Total number of errored frames received from all ports. |
| Refresh | Refreshes switch summary statistics. |
| Clear | Clears (or sets to zero) switch summary statistics. |

# Port Statistics Screen

The Port Statistics Screen allows you to display statistics for each port on the switch. Many of these statistics correspond to the Statistics group of RMON. You can also refresh or clear the statistics. Select **d** from the Switch Statistics Screen to view the Port Statistics screen. Figure 3-21 shows the Port Statistics Screen and Table 3-20 describes the screen.

```
PORT 1 STATISTICS              Access Control: READ/WRITE

Frames Transmitted       0  Collisions               0
Frames Received          0  Late Collisions          0
Frames Forwarded         0  CRC/Alignment Errors     0
Frames Filtered          0  Undersized Frames        0
Frames Dropped           0  Oversized Frames         0
Broadcasts Transmitted   0  Fragments                0
Broadcasts Received      0  Jabbers                  0
Multicasts Transmitted   0  64 Byte Frames           0
Multicasts Received      0  65 to 127 Byte Frames    0
Bytes Transmitted        0  128 to 255 Byte Frames   0
Bytes Received           0  256 to 511 Byte Frames   0
Pause Frames Transmitted 0  512 to 1023 Byte Frames  0
Pause Frames Received    0  1024 to 1518 Byte Frames 0

  r. Refresh   c. Clear   x. Previous Menu

Enter Selection:
```

**Figure 3-21** Port Statistics Screen

**Table 3-20**
**Port Statistics Screen Descriptions**

| Field | Description |
|---|---|
| Frames Transmitted | Total number of frames transmitted on the port. |
| Frames Received | Total number of frames received on the port. |
| Frames Forwarded | Total number of frames received on the port which were forwarded to other ports. |
| Frames Filtered | Total number of frames received on the port which were filtered. |
| Frames Dropped | Total number of frames received which the switch due to lack of resources dropped. |

*continued*

*Port Statistics Screen Descriptions continued*

| Field | Description |
|---|---|
| Broadcasts Transmitted | Total number of broadcast frames transmitted on the port. |
| Broadcasts Received | Total number of broadcast frames received on the port. |
| Multicasts Transmitted | Total number of multicast frames transmitted on the port. |
| Multicasts Received | Total number of multicast frames received on the port. |
| Bytes Transmitted | Total number of bytes transmitted on the port. |
| Bytes Received | Total number of bytes received on the port. |
| Pause Frames Transmitted | Total number of flow control pause frames transmitted on the port (not used) |
| Pause Frames Received | Total number of flow control pause frames received on the port. |
| Collisions | Total number of collisions detected on the port. |
| Late Collisions | Total number of late collisions detected on the port. |
| CRC/Alignment Errors | Total number of frames received on the port which had either a CRC or an alignment error. |
| Undersized Frames | Total number of frames received on the port which were undersized. |
| Oversized Frames | Total number of frames received on the port which were oversized. |
| Fragments | Total number of frames received on the port which were fragments. |
| Jabbers | Total number of frames received on the port which were jabbers. |
| 64 Byte Frames | Total number of frames received on the port which were 64 bytes in length. |
| 65 to 127 Byte Frames | Total number of frames received on the port which were from 65 to 127 bytes in length. |
| 128 to 255 Byte Frames | Total number of frames received on the port which were from 128 to 255 bytes in length. |
| 256 to 511 Byte Frames | Total number of frames received on the port which were from 256 to 511 bytes in length. |
| 512 to 1023 Byte Frames | Total number of frames received on the port which were from 512 to 1023 bytes in length. |
| 1024 to 1518 Byte Frames | Total number of frames received on the port which were from 1024 to 1518 bytes in length. |
| Refresh | Refreshes port statistics. |
| Clear | Clears (or sets to zero) port statistics. |

# General Information Screen

The General Information Screen allows you to view general system information. Select **e** from the Main Menu to view the General Information Screen. Figure 3-22 shows the General Information Screen and Table 3-21 describes the screen.

```
GENERAL INFORMATION    Access Control: READ/WRITE

  Software Version          1.10.00
  Serial Number             100
  Base MAC Address          00c0ba000000
  Up Time (minutes)         12
  Power Up Count            1

  x. Previous Menu

Enter Selection:
```

**Figure 3-22** General Information Screen

**Table 3-21**
**General Information Screen Descriptions**

| Field | Description |
|---|---|
| Software Version | The version of system software currently operating on the switch. |
| Serial Number | The serial number of the switch. |
| Base MAC Address | The base MAC address of the switch (port 1 address). |
| Up Time (minutes) | The number of minutes the switch has been operational since the last power cycle or reset. |
| Power Up Count | The number of times the system has powered up or been reset since the switch was originally shipped from the factory. |

# Download Software Menu

The Download Software Menu allows you to set up and initiate a software download. Select **f** from the Main Menu to view the Download Software Menu. Figure 3-23 shows the Download Software Menu and Table 3-22 describes the menu.

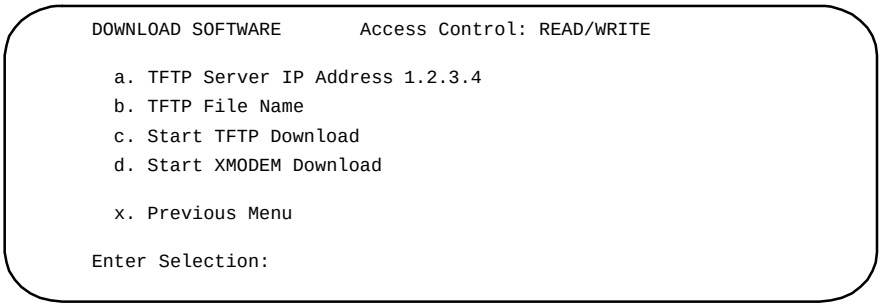

DOWNLOAD SOFTWARE Access Control: READ/WRITE
a. TFTP Server IP Address 1.2.3.4
b. TFTP File Name
c. Start TFTP Download
d. Start XMODEM Download
x. Previous Menu
Enter Selection:

**Figure 3-23** Download Software Menu

**Table 3-22**
**Download Software Menu Descriptions**

| Selection | Description |
|---|---|
| TFTP Server IP Address | The IP address of the TFTP server. |
| TFTP File Name | The file name to be downloaded from the TFTP server (maximum of 80 characters). |
| Start TFTP Download | Starts a TFTP download using TFTP Server IP Address and TFTP File Name information. |
| Start XMODEM Download | Starts an XMODEM (serial) download. |

## Save Current Configuration

The Save Current Configuration screen ensures that all changes made to the switch via the console menus will be stored in the event of power outages or power cycles.

To save your current configuration, do the following:

1. Select **g** from the Main Menu to view the Save Current Configuration screen.

   The following message prompt displays:

   ```
   The current settings will become permanent.
   All the saved settings will be lost!

   a. OK
   x. Cancel and return to the Previous Menu
   ```

2. Select either **a** to confirm the process or **x** to cancel the process.

## Return to Default Configuration

The Return to Default Configuration screen allows you to restore the original factory default switch settings before changes were made via the user interface or SNMP.

To return to default configuration settings, do the following:

1. Select **h** from the Main Menu to view the Return to Default Configuration screen.

   The following message prompt displays:

   ```
   Switch will return to default settings.
   All the current changes and settings will be lost!
   a. OK
   x. Cancel and return to the Previous Menu
   ```

2. Select either **a** to confirm the process or **x** to cancel the process.

## Logout

The Logout menu item allows you to log out of the user interface and return to the Login screen. Select **i** from the Main Menu to logout. After this command is entered, the system logout occurs automatically.

# Reset

The Reset screen allows you to restore the latest saved configuration or system defaults if the system configuration has not been saved.

To reset the switch, do the following:

1. Select **j** from the Main Menu to view the Reset screen.

   The following message prompt displays:

   ```
   Switch will go through a hardware reset.
   All the current changes that have not been saved will be
   lost!
   a. OK
   x. Cancel and return to the Previous Menu
   ```

2. Select either **a** to confirm the process or **x** to cancel the process.

# *Chapter 4*
# Configuring and Monitoring the Switch

## Common Tasks

The switch console menus allow you to modify default switch settings and configure the switch for network management. They also allow you to monitor switch performance and status. See Chapter 3, "User Interface," for an overview of the menu hierarchy and a description of all menus. The following sections describe common tasks in setting up and operating the switch.

To begin, set operating parameters and make sure the network connections are correct by performing these tasks:

- Setting password protection for the switch to prevent unauthorized access to console menus
- Assigning an IP address for the switch if you plan to manage the switch using SNMP, or if you use Telnet to access the switch
- Checking network configuration status and verifying that network connections are correct

After the switch is installed and operating, you may want to perform any of the following tasks:

- Connecting via Telnet for in-band access to the console menus
- Setting SNMP parameters for management access
- Viewing switch statistics to monitor and evaluate switch performance and traffic patterns on the network
- Configuring port mirroring
- Downloading a software upgrade
- Configuring Spanning Tree parameters
- Configuring VLANs
- Configuring Class of Service

- Configuring port operation (enable/disable, port speed, full/half duplex and flow control)
- Configuring the forwarding table
- Configuring the broadcast cutoff rate
- Setting a default gateway
- Configuring BootP/DHCP

## Setting Password Protection

The SW3322/SW3323/SW3324 switch is factory-configured with access rights to the console menus set to READ/WRITE. This setting allows anyone to use the console menus to modify any operational parameter. To protect the configuration of the switch from unauthorized modification, you should enable password protection to the console menus.

To enter a password, do the following:

1. Select Password from the System Configuration Menu and press [Enter].
2. Enter a password containing six to eight alphanumeric characters.

The password is not case sensitive. For verification, you are asked to enter your password again. If both entries agree, the new password is stored.

By factory default, there is a password configured. At the `login:` prompt, type "public" and press [Enter] to gain READ/WRITE access to the console menus. When you configure the password parameter, the factory default setting is deactivated and the new password governs access to the console menus.

After you enter a password and logout using the Logout command from the Main Menu, all access rights change to READ-ONLY. The current level of access control is indicated at the top of the management screen.

If forget your password, contact Compaq Customer Support.

**NOTE:** You are automatically logged out from the console menus based on the Screen Timeout setting in the System Configuration Menu. A setting of "0" permits the console menus to remain available indefinitely.

## Assigning an IP Address

To assign an IP address to the switch, do the following:

1. Select System Configuration Menu from the Main menu.
2. Select IP address from the menu and enter the IP address. Press <Enter>.

The IP address is now programmed. Select Subnet Mask from the menu and enter the appropriate mask.

## Checking Network Configuration Status

To check connection status for the network, do the following:

1. Select Port Menu from the Main Menu.

   If a network cable is properly connected to a port, the Link Status for the port reads CONNECTED. If no cable is connected to a port, or if the cable or port is faulty, the Link Status for the port reads DISCONNECTED.
2. If you see a DISCONNECTED status for a connected port, plug the cable into another port on the switch or try another cable.

## Connecting via Telnet

You can connect to the switch from a remote location using the Telnet application. This application allows you to establish in-band access to the console menus.

To connect to the switch via Telnet, do the following:

1. Assign an IP address using the System Configuration Menu.
2. Set a password using the System Configuration Menu.
3. Login to the switch via Telnet using the configured IP address and the password.

## Setting SNMP Management Access

Access to the switch through SNMP is controlled by community names. The community names set for the switch must match those used by the SNMP management station for successful communication to occur. The switch uses two community names. The “Public” community name allows read-only access to the device via SNMP. The “Private” community name allows read/write access.

Switches can send SNMP messages called traps to SNMP management stations when an important event occurs with the switch. The switch allows up to four destinations to be configured for these trap messages to be sent.

To configure SNMP access for the switch, do the following:

1. Select System Configuration Menu from the Main Menu.
2. Select SNMP Configuration Menu.
3. Select SNMP Private Community Name from the menu and enter the desired read/write access Community name (you are permitted to enter from one to 10 characters).
4. Select SNMP Public Community Name and enter the desired read-only community name (you are permitted to enter from one to 10 characters).
5. Select one or more Trap Destination entries from the menu and enter the appropriate IP addresses.
6. Enter a corresponding community name for each trap destination entered.

## Viewing Switch Statistics

To view switch statistics, do the following:

1. Select Switch Statistics Screen from the Main Menu.

   The screen lists the main statistical counts for all ports on the switch simultaneously.

2. Select Switch Summary from the Switch Statistics Screen.

   The screen lists a summary of sum total statistics for all ports on the switch.

3. Select Port Statistics from the Switch Statistics Screen.

4. Enter the port number. Press <Enter>.

   The screen lists expanded port-level statistics for an individual port.

5. On any of the statistics screens, select Clear to clear (zero) the displayed statistical counts and Refresh to refresh (update) the displayed statistical counts.

## Configuring Port Mirroring

You can mirror the traffic being switched on any port for the purposes of network traffic analysis and connection assurance. When Port Mirroring is enabled, one port in each group of eight becomes a monitor port for any one of the other ports within the group.

To configure port mirroring, do the following:

1. Select Port Mirroring Enable from the Switch Configuration Menu.

   The prompt will indicate “Yes”

2. Select Mirrored Port for the port to be mirrored (traffic information source).

3. Select Mirroring Port for the port that receives the mirrored data (traffic information destination).

4. Connect a traffic analyzer or RMON probe to the mirroring port.

**NOTE:** Port mirroring is not supported on the Gigabit Ethernet ports.

## Downloading a Software Upgrade

You can upgrade the operational software in the switch without physically opening the switch or being in the same location. The software storage sector in the flash memory of the switch is reprogrammable. This feature allows you to easily download software feature enhancements and problem fixes to the switch from a local or remote location.

You can download software to the switch in two ways:

- Via the serial port. This procedure is an out-of-band operation that copies the software through the serial port to the switch. This operation takes approximately 10 minutes and requires minimal configuration.
- Via TFTP download. This procedure uses a TFTP server connected to the network and downloads the software using the TFTP protocol. A TFTP download is much faster than a serial download, requiring only a few seconds, and can be used to upgrade a switch that is not physically proximate. The disadvantage is that this method requires a TFTP server and additional setup.

## Downloading Via the Serial Port

A serial download is the easiest method to upgrade the switch software, requiring the least amount of equipment and configuration.

To download switch software via the serial port, do the following:

1. Select Download Software Menu from the Main Menu.
2. Select Start XMODEM Download.

   The following message prompt displays:

   ```
   Software downloader is running.

   Software downloader request: Please start XMODEM
   transfer (9600, N, 1).
   ```

   (Please ignore any characters that may appear on the next line).
3. Send the file using the XMODEM protocol from your computer application (the procedure varies depending upon the application used).

When the XMODEM procedure finishes, the following message prompt displays:

```
Software download successfully completed XMODEM download.
Please wait while program flash is being written. Software
downloader is exiting after successful download to flash.
Please wait while system initializes.
```

The system software will reinitialize and display the login prompt.

## Downloading Via TFTP

To perform a TFTP download, you must first configure the switch. This consists of programming the switch with an IP address, if this has not already been done, and entering the IP address of the TFTP server and the name of the upgrade file. To program the switch IP address, go to the System Configuration Menu that is accessible from the Main Menu screen.

To download switch software via TFTP, do the following:

1. Select TFTP Server IP Address from the Download Software Menu.
2. Enter the TFTP server IP address and press <Enter>.
3. Select TFTP File Name and enter the file name to be downloaded from the TFTP server.

   **NOTE:** For a TFTP download, the path to the file must be included in its name. For example, if the upgrade file name is switch.bin and it resides in the directry/usr/tftp on the TFTP server, then you must enter the TFTP file name as "/usr/tftp/switch.bin".

4. If necessary, configure the address of an IP gateway to reach the server from the switch using the Default Gateway field on the System Configuration Menu.
5. Configure the TFTP server by copying the download file from the upgrade disk to an appropriate directory and starting the server.
6. Select Start TFTP Download and press <Enter>.

To verify that the TFTP download has been successfully completed, note the software version level (SW Version x.xx) displayed on the top right portion of the Main Menu. You can also view the software version on the General Information Screen accessible from the Main Menu. This number should match the version number that appears on the upgrade disk.

## Configuring Spanning Tree Parameters

The SW3322/SW3323/SW3324 switch supports the IEEE 802.1D Spanning Tree Protocol. This protocol allows redundant connections to be created between LAN segments for fault tolerance. Two or more physical paths between different segments can be created through the switch, with the Spanning Tree Protocol choosing a single path at any given time and disabling all others. If the chosen path fails for any reason, a disabled alternative is activated, thereby maintaining the connection. See Appendix B, “Spanning Tree Concepts” for further information on using the Spanning Tree Protocol in a network.

**WARNING:** Configuring Spanning Tree parameters from their default can cause serious deterioration of network performance.

To configure Spanning Tree Parameters, do the following:

1. Select Switch Configuration Menu from the Main Menu.
2. Select Spanning Tree Configuration Menu.
3. Turn the switch Spanning Tree operation on or off by toggling the Spanning Tree Protocol Enable option by pressing **a**.
4. Select Port Configuration.

The Spanning Tree Port Configuration Menu displays. Change the parameters that display in this menu as required.

## Configuring VLANs

A virtual LAN (VLAN) is a group of devices on one or more LANs that are configured such that they can communicate as if they were attached to the same wire. Because VLANs are based on logical instead of physical connections, they are extremely flexible. The most fundamental benefit of VLAN technology is the ability to create workgroups based on function rather than on physical location or media. For further information, see Appendix C, "Virtual LANs (VLANs)."

To configure VLANs, do the following:

1. Select Switch Configuration Menu from the Main Menu.
2. Select VLAN Configuration Menu.
3. Turn the global switch VLAN operation on or off by toggling the VLAN Enable option by pressing **a**.
4. Select VLAN Menu.

   The VLAN Menu displays. This menu displays the current configuration of VLANs in the system.
5. To delete a current VLAN, select Delete, then enter the number of the VLAN.
6. To configure a VLAN, select Configure and enter a VLAN number. A new VLAN can be created this way.

   The VLAN #n Configuration Menu displays. From this menu, you can configure VLAN names, add/delete ports in a VLAN, and add/delete egress ports for a VLAN.
7. From the main VLAN Configuration Menu, select VLAN Port Menu to configure the VLAN port mode (hybrid or access) for individual ports.

## Configuring Class of Service

You can configure Class of Service parameters using the Class of Service Configuration Menu. This menu permits you to configure priority levels to traffic being forwarded through the switch. During periods of congestion, Class of Service settings ensure that traffic which has been assigned high priority is forwarded through the switch ahead of normal priority traffic. For further information, see Appendix D, "Class of Service."

To configure Class of Service, do the following:

1. Select Class of Service Configuration Menu from the Switch Configuration Menu.
2. Press **a** to turn the global switch Class of Service operation on or off by toggling the Class of Service Enable option.
3. Select Priority Threshold and type a number between 0 and 7.
4. Select Configure Port Priority.

The Port Priority Menu displays. From this menu, individual port priority levels can be configured.

## Configuring Port Operation

You can configure RJ-45 ports for operational parameters such as auto-negotiation, duplex mode, port speed, and flow control. 1000Mb/s port speed and duplex mode are 1000Mb/s and full duplex respectively, and are thus not configurable.

To configure port operation, do the following:

1. Select Port Menu from the Main Menu.
2. Select Configure and enter a port number. Press <Enter>.

   The port number entered displays on the top of the Port Configuration screen.
3. Select Port Name and enter a Port Name. Press <Enter>.
4. Select Port Enable to toggle between enabling (Yes) and disabling (No) the port.
5. Select Flow Control Enable to toggle between enabling (Yes) or disabling (No) flow control on the port.
6. Select Auto-negotiation Enable to toggle between enabling (Yes) or disabling (No) auto-negotiation on the port.

**NOTE:** If Auto-negotiation Enable is set to No, the Full Duplex and Port Speed modes need to be configured.

If Auto-negotiation Enable is set to Yes, the Full Duplex and Port Speed fields disappear and the system automatically configures these functions.

7. Select Full Duplex to toggle between Yes (Full Duplex) and No (Half Duplex) mode on the port.
8. Select Port Speed to toggle between 10Mbps and 100Mbps speeds on the port.

## Configuring the Forwarding Table

The Forwarding Table allows you to designate forwarding treatment through the switch for specific MAC addresses, allowing you to maintain the efficiency and security of your network. You can search for specific MAC addresses by the address itself or by port number. The switch learns addresses dynamically from incoming packets and builds a table of these addresses along with their associated ports. There are three types of MAC addresses in the forwarding table:

- Dynamic MAC addresses - which remain in the forwarding table for a time period defined using the Forwarding Table Aging Time option in the Switch Configuration Menu.
- Static MAC addresses - which are entered manually, stored in nonvolatile memory, and automatically placed in the forwarding table.
- System MAC addresses - which are set by the system software and cannot be modified. Each switch port has a permanent MAC address assigned to it.

There are three types of dispositions associated with each address in the forwarding table:

- Forward - which directs packets destined for a specific MAC address to a specific port.
- Discard - which drops packets destined for a specific MAC address (and thus provides a security function by blocking certain packets).
- Local - which is for packets destined for the switch itself (such as a “local” SNMP management packet).

To configure the forwarding table, do the following:

1. Select Switch Configuration Menu from the Main Menu.
2. Select Forwarding Table Configuration Menu.

To either make an existing dynamic entry static (Make Entry Static) or delete a static entry (Delete Static Entry), do the following:

1. Select the letter associated with the option.

   The following message prompt displays:

   ```
   Enter MAC Address:
   ```

2. Enter the MAC address. Press <Enter>.

To either add a static entry (Add Static Entry) or modify a static entry (Modify Static Entry), do the following:

1. Select the letter associated with the option.

   The following message prompt displays:

   ```
   Enter MAC Address:
   ```

2. Enter the MAC address. Press <Enter>.

   The following message prompt displays:

   ```
   Forward to Port (Y/N):
   ```

3. Do one of the following:

   a. If you select “Y” and Press <Enter>, the system displays:

      ```
      Enter Port Number (1-26):
      ```

      Enter the port number and press <Enter>.

   b. If you select “N” and press <Enter>, the system displays “discard” in the Disposition field.

## Configuring Broadcast Cutoff Rate

This setting affects what is known as "Broadcast Throttling," which defines how the switch will handle excessive broadcast or unicast packets with unknown MAC addresses. Normally, when the switch receives these packets, they will be forwarded (flooded) to every port. However, if the receiving rate of these packets exceeds the broadcast cutoff rate, the switch will "throttle back" the forwarding of these packets based on the configured Broadcast Cutoff Rate. This mechanism helps to prevent broadcast storms.

To configure the broadcast cutoff rate, do the following:

1. Select Switch Configuration Menu from the Main Menu.
2. Select Broadcast Cutoff Rate, enter the rate value, and press <Enter>.

Valid values are in the range from 100 to 500,000.

## Setting a Default Gateway

The Default Gateway parameter defines the IP address of a router or other network device to which IP packets are to be sent if destined for a subnet outside of that which the switch is operating.

To set a default gateway, do the following:

1. Select System Configuration Menu from the Main Menu.
2. Select Default Gateway.
3. Enter the gateway IP address. Press <Enter>.

## Configuring BootP/DHCP

The DHCP and BootP protocols allow you to automatically configure the switch's IP address information. Enabling this feature greatly speeds up device configuration, especially when a large number of devices are installed. A DHCP and/or BootP server must be operating on the network and be properly configured for this option to work. When this option is enabled, the switch first tries to obtain an IP address from a DHCP server. If this fails, the switch tries to obtain an IP address from a BootP server. If this fails, the switch uses a previously configured IP address, if one exists.

To configure BootP/DHCP, do the following:

1. Select System Configuration Menu from the Main Menu.
2. Select BootP/DHCP Enable.

This selection toggles between Enable and Disable.

# *Chapter 5*
# SNMP Management

## The SNMP Protocol

SNMP (Simple Network Management Protocol) is a communication protocol designed specifically for the purpose of managing devices or other elements on a network. Network equipment commonly managed with SNMP includes hubs, switches, routers, and host computers. SNMP is typically used to configure these types of devices for proper operation in their network environment, as well as to monitor them to evaluate their performance and detect potential problems.

Managed entities supporting SNMP typically contain software, which runs locally on the device and is referred to as an agent. In Figure 5-1, software in the switch functions as an agent, monitoring and controlling the functionality of the switch. A defined set of variables, referred to as managed objects, is maintained by the agent and used to manage the device. These objects are defined in a Management Information Base (MIB) which allows for a standard presentation of the information controlled by the agent over the network.

The software used to access the information maintained by the SNMP agents across a network is referred to as the SNMP Manager, and typically runs on a workstation.

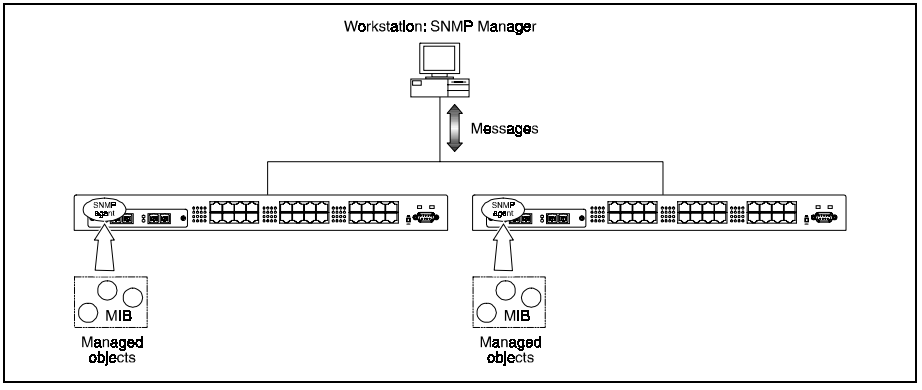



**Figure 5-1** Switches Managed by an SNMP Management Workstation

The SNMP manager software uses a MIB specification, equivalent to that which the agent maintains, to read and write objects controlled by the agent for purposes of configuring and monitoring the device. SNMP defines the format of the MIB specifications and the protocol used to access this information.

There are three main operations defined in SNMP:

- Operations that read information from the managed device, such as those used to obtain status or statistical data, are called GET operations.
- Operations that change a functional parameter on the device, such as those used to configure Spanning Tree or to initiate a software download, are referred to as SET operations. GET and SET operations are initiated only by the manager software, and result in a response by the agent.
- The third operation type, the TRAP, allows the agent to send an unsolicited message to the manager. This operation is typically used as an alert of a potential problem or a change of status with the device. The Trap Destination parameter in the SNMP Configuration Menu is used to configure the IP addresses of the SNMP Manager to which trap messages are sent.

**NOTE:** The user must install both the Compaq Networking Management Software and SW3322, SW3323, SW3324 Product Management Module to manage the SW3322, SW3323, SW3324 switches by SNMP.

## MIB Objects

A number of different MIB specifications have been defined for managing network equipment, some standard and some proprietary. SNMP compliant devices typically support one or more standard MIBs defined by the Internet Engineering Task Force (IETF), in the form of Request for Comments (RFC) documents.

These MIBs provide a common method of managing devices, such as switches and hubs, and network interfaces, such as Ethernet and token ring. The primary standard MIB, referred to as MIB-II, provides an overall view of the managed agent and must be supported, at least in part, by all SNMP agents. In addition, commercial vendors define proprietary MIB extensions for managing device-specific functions of their products.

The SW3322/SW3323/SW3324 switch supports four standard MIBs:

- RFC 1213 - Management Information Base for Network Management of TCP/IP based Internets (MIBII)
- RFC 1398 - Definitions of Managed Objects for the Ethernet-like Interface Types (Ethernet MIB)
- RFC 1493 - Definitions of Managed Objects for Bridges
- RFC 1757 - Remote Network Monitoring Management Information Base

The switch also supports Compaq proprietary MIB extensions.

## RFC 1213 (MIB-II)

RFC 1213 provides management of switch system-level parameters, including TCP/IP protocol-related statistics, IP addressing, routing table information, and interface statistics for each switch port. MIB-II is the standard MIB defined by RFC 1213. All agent devices operating SNMP are required to support at least part of MIB-II.

This MIB reports information about the protocols and network interfaces supported on the agent itself, as well as other general information. The MIB is divided into a number of groups, each of which corresponds to a specific protocol or set of information. Some groups are defined in other RFC documents.

The groups specifically defined in RFC 1213 and supported by the switch system software are as follows:

- System – General information about the agent system
- Interfaces – Information about the network interfaces of the system
- Address Translation – Interface address information, both MAC level and network (IP) level
- IP – Statistics and information related to the IP protocol
- ICMP – Statistics and information related to the ICMP protocol
- TCP – Statistics and information related to the TCP protocol
- UDP – Statistics and information related to the UDP protocol
- Transmission – Statistics and information related to the physical network medium to which the system interfaces (e.g. Ethernet, token ring, etc.).
- SNMP – Statistics and information related to the SNMP protocol

## RFC 1398 (Ethernet MIB)

RFC 1398 provides management and monitoring for the Ethernet-specific aspects of each port on the switch. This is the Ethernet-specific statistics subgroup of the MIB-II Transmission group. This group provides a set of statistics related to Ethernet's physical level operation. Specifically, error and collision-related statistics are presented.

## RFC 1493 (Bridge MIB)

RFC 1493 is a group defined under MIB-II. This MIB deals with the operation of the system as an 802.1D-compliant bridge. Areas of functionality supported by this group include Spanning Tree and forwarding table information and configuration.

## RFC 1757 (RMON MIB)

RFC 1757 is a group defined under MIB-II. This MIB provides management for the RMON aspects of the switch. The SW3322/SW3323/SW3324 switches support four of the nine groups of RMON defined for Ethernet networks on a per port basis. For further information, see the subsection “RMON” in Chapter 1.

## Proprietary MIB Extensions

Areas of switch function not covered by the standard RFC MIBs are specified in the private MIB. This MIB definition is specified separately from MIB-II. Areas covered in this MIB include various system, switch, and port level information. System information MIB variables are shown in Table 5-1, switch information variables in Table 5-2, and port variables in Table 5-3.

**Table 5-1**
**System Information Variables**

| Variable | Description |
|---|---|
| SerialNo | Serial number of the unit. |
| TftpIpAddress | TFTP server IP address for TFTP downloads. |
| TftpFilename | Filename of the download upgrade file on the TFTP server. |
| PowerUpCount | Cumulative number of times switch has powered up or been reset. |
| BroadcastCutoffRate | Per second rate at which the forwarding of broadcast and unknown DA frames will be throttled back to by the switch. |
| GatewayIPAddress | IP address of the default gateway (router) to which packets destined for another subnet are sent. |
| TftpStartDownload | Start TFTP downloads via SNMP, using TftpIpAddress and TftpFilename. |
| BootpDhcpEnable | Enable/disable BootP/DHCP for IP address configuration. |
| Reset | Remotely execute a software reset of the switch. |

**Table 5-2**
**Switch Information Variables**

| Variable | Description |
|---|---|
| SwitchIpAddress | IP address of the switch, used for management. |
| SwitchSubnetMask | Subnet mask corresponding to the SwitchIPAddress. |
| ActiveAgingTime | Aging tick period in seconds where addresses in the forwarding table are aged out. |
| SwitchStpStatus | Enable/disable operation of Spanning Tree on the switch. |
| SwitchManager | List of SNMP trap manager IP addresses. |
| SwitchTrapRcvr1 | |
| SwitchTrapRcvr2 | |
| SwitchTrapRcvr3 | |
| SwitchTrapRcvr4 | |
| SwitchPortMirroringStatus | Enable/disable port mirroring operation of the switch. |
| SwitchMirroredPort | The port to be mirrored from. |
| SwitchMirroringPort | The port to be mirroring to. |
| SwitchVlanEnable | Enable/disable global VLAN operation of the switch. |
| SwitchVlanConfigTable | Table indexed by SwitchVlanId. |
| SwitchVlanId | VLAN number or ID. |
| SwitchVlanName | Text string for VLAN name. |
| SwitchVlanPorts | Ports in the VLAN. |
| SwitchVlanStatus | Variable used to add or delete entries from the VlanConfigTable. |
| SwitchVlanEgressPorts | Ports to which traffic destined for this VLAN may be transmitted. |
| SwitchVlanStatus | Variable used to add or delete entries from the VlanConfigTable. |
| SwitchVlanPortTable | Table indexed by SwitchVlanPortId. |
| SwitchVlanPortId | Port number or ID. |
| SwitchVlanPvid | The port VLAN ID (PVID) for this port. |
| SwitchVlanPortType | The type of VLAN this port is operating as, either hybrid or access. |
| SwitchPriorityEnable | Enable/disable global traffic priority in the switch. |
| SwitchPriorityThreshold | Priority threshold level (0-7) in the switch which defines switch traffic to be high or low priority. |
| SwitchPriorityPortTable | Priority table indexed by SwitchPriorityPortId. |
| SwitchPriorityPortId | Port number or ID. |
| SwitchPriorityDefault | Priority level (0-7) assigned to untagged traffic entering the associated port. |

**Table 5-3**
**Port Table Variables**

| Variable | Description |
|---|---|
| PortId | Port number or ID. |
| PortStatus | Link status of the port. |
| PortDuplexStatus | Full/half duplex setting of the port. Not configurable if auto-negotiation is enabled. |
| PortName | Text name assigned to the port. |
| PortEnable | Enable/disable status of the port. |
| PortSpeed | Speed the port is operating at. Not configurable if auto-negotiation is enabled. |
| PortAutonegEnable | Enable/disable auto-negotiation on the port. |
| PortFlowControlEnable | Enable/disable flow control on the port. |
| PortType | The type of port: 10Base-T, 100Base-TX, 100Base-FX, 1000Base-SX and optional GBIC module for 1000Base-LX. |

# Compiling MIB Extensions

The MIBs supported by the switch must be compiled into the SNMP network management platform before the switch can be managed. The supported MIBs are provided as files on the CD shipped with the unit. The four standard MIB specifications listed above with which the switch is compliant are generally available with the SNMP management platform. Application modules specific to managing the switch under different network management platforms are available. Contact Compaq for information regarding supported platforms.

# *Appendix A*
# Technical Specifications

## General

### Standards Compliance

- IEEE 802.1D Transparent Bridging Specifications (ISO/IEC 10038)
- IEEE 802.1p Traffic Class Expediting and Dynamic Multicast Filtering
- IEEE 802.1Q Virtual Bridged Local Area Networks
- IEEE 802.2 Local Area Networks, Logical Link Control (LLC)
- IEEE 802.3 CSMA/CD 9 (ISO/IEC 8802-3)
- IEEE 802.3i 10Base-T (ISO/IEC 8802-3, clause 14)
- IEEE 802.3u 100Base-TX (ISO/IEC 8802-3, clause 25)
- IEEE 802.3u 100Base-FX
- IEEE 802.3z Gigabit Ethernet
- IEEE 802.3x Flow Control
- EIA RS-232C (DTE-to-DCE)
- EIA RS-310C (19” rackmount)

### Certification

- Emissions: FCC Part 15, Class A, EN55022 (CISPR 22)
- Safety: UL 1950, cUL CSA 22.2-950, EN60950 (TUV)
- CE Mark: 89/336/EEC; 93/68//EEC; 73/23/EEC
- Immunity: IEC 801-2; IEC 801-3; IEC 801-4; EN 50082-1

## Data Rate

- 10 Mb/s Manchester encoded or 100 Mb/s 4B/5B encoded
- 1000 Mb/s encoded

## Environmental Specifications

- Operating temperature: 32° to 113° F ( 0° C to 45° C)
- Operating humidity: 5 to 95% relative, non-condensing
- Storage temperature: -22° to 158°F (-30° C to 70° C)
- Storage humidity: 5 to 95% relative, non-condensing

## Electrical Specifications

- Input voltage: 100-240 VAC
- Input frequency: 50-60 Hz
- Maximum power consumption: 75 VA

## Physical

- Height: 1.75 in. (4.4 cm)
- Length: 16.0 in. (40.6 cm)
- Width: 17.1 in. (43.4 cm mountable in a standard 19 in. rack)
- Weight: 10.5 lb. (4.8 kg)

## Microprocessor

- Type: Intel i960J series, 32 bit
- Speed: 33 MHz

### Memory

- Processor DRAM: 2 MB (SW3322/3323), 4 MB (SW3324)
- Packet Buffer Memory: 4 MB/8 ports of 10/100Mb/s, 8MB/Gigabit Ethernet ports
- Flash Memory: 1 MB (SW3322/SW3323), 2 MB (SW3324)

## Port Specifications

### Console Port

Table A-1 shows the console port pin assignments.

**Table A-1**
**RS-232 Console Port Pin Assignments**

| Pin | Signal Name |
|---|---|
| 1 | RTS/CTS |
| 2 | TXD |
| 3 | RXD |
| 4 | DSR |
| 5 | GND |
| 6 | DTR |
| 7 | DCD |
| 8 | DCD |
| 9 | Not Used |

## 10Base-T and 100Base-TX Ports

The switch provides IEEE 802.3u auto-negotiation on its 10Base-T/100Base-TX ports for 10/100 speed and full/half duplex operation. Table A-2 shows the 10Base-T/100Base-TX pinouts. These ports are wired MDI-X. All undefined pins are not used.

**Table A-2**
**10Base-T/100Base-TX Pinouts**

| Pin | MDI-X Signal Name |
|---|---|
| 1 | RD+ |
| 2 | RD- |
| 3 | TD+ |
| 6 | TD- |

## MDI/MDI-X Crossover Cable Wiring

Figure A-1 shows the wiring scheme for implementing a crossover cable if needed for connection to the switch's 10Base-T or 100Base-TX ports. Such a cable may be required when connecting the switch to another switch or a hub device.

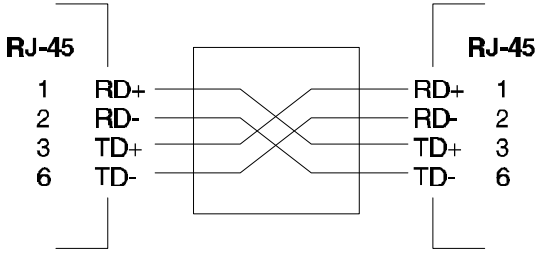



**Figure A-1** External Crossover Cable Wiring

# *Appendix B*
# Spanning Tree Concepts

## General

The IEEE 802.1D Spanning Tree Protocol resolves the problems of physical loops in a network by establishing one primary path between any two switches in a network. Any duplicate paths are barred from use and become standby or blocked paths until the original path fails, at which point they can be brought into service.

## Spanning Tree Features

The switch meets the requirements of the Spanning Tree Protocol (STP) by performing the following functions:

- Creates a single spanning tree from any arrangement of switching or bridging elements.

  **NOTE:** The term "switch" is used as an equivalent to "bridge" in this document.

- Compensates automatically for the failure, removal, or addition of any device in an active data path.
- Achieves port changes in short time intervals, which establishes a stable active topology quickly with a minimum of network disturbance.
- Uses a minimum amount of communications bandwidth to accomplish the operation of the Spanning Tree Protocol.
- Reconfigures the active topology in a manner that is transparent to stations transmitting and receiving data packets.
- Manages the topology in a consistent and reproducible manner through the use of Spanning Tree Protocol parameters.

# Spanning Tree Protocol in a Network

Figure B-1 illustrates the use of three SW3322 switches to establish an effective Spanning Tree configuration. Figure B-2 illustrates the same principal using three SW3323 switches. Switches A, B and C are connected together in a redundant topology (more than one path between two points). If the connection between A and B goes down, the link between A and C becomes active, thereby establishing a path between A and B through switch C. Additionally, if the connection between B and C goes down, the link between A and C becomes active, establishing a path between B and C through switch A.

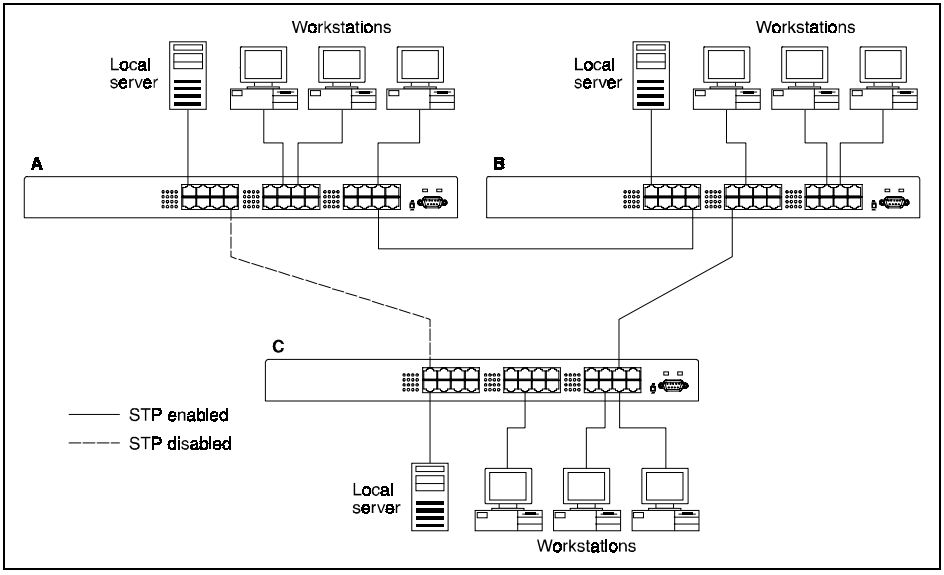



**Figure B-1** Spanning Tree Configuration Using SW3322 Switches

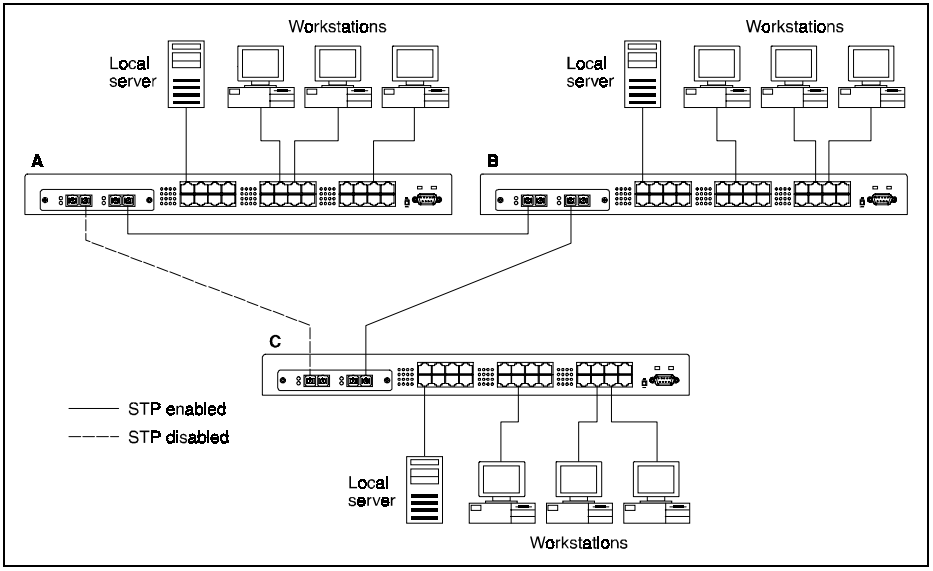



**Figure B-2** Spanning Tree Configuration Using SW3323 Switches

## Spanning Tree Protocol Parameters

Several configuration parameters control the operation of the Spanning Tree Protocol. Table B-1 describes the parameters and lists the switch default settings for each parameter. The values listed in the table are for a 24 port switch.

**CAUTION:** You can cause serious network performance degradation if you do not fully understand Spanning Tree concepts. Be sure to consult personnel experienced with this process prior to configuring Spanning Tree parameters.

**Table B-1**
**Spanning Tree Protocol Defaults**

| Parameter | Description | | | Default Value |
|---|---|---|---|---|
| Bridge Group Address | Unique MAC group address, recognized by all bridges in the network. | | | |
| Bridge Identifier | Identifier for each bridge. This parameter consists of two parts: a 16-bit bridge priority and a 48-bit network adapter address. Ports are numbered in absolute numbers starting from 1 regardless of their bridge attachment. The network adapter address is the same address as the first port of the bridge. | | | 32768 (bridge priority) |
| Port Identifier | Identifies each port of each bridge, with an incremental default value given for each port (SW3322 switch shown). | | | |
| | Port 1 -32768 | Port 9 -32776 | Port 17 -32784 | Port 25 - 32792 |
| | Port 2 -32769 | Port 10 -32777 | Port 18 -32785 | Port 26 - 32793 |
| | Port 3 -32770 | Port 11 -32778 | Port 19 -32786 | |
| | Port 4 -32771 | Port 12 -32779 | Port 20 -32787 | |
| | Port 5 -32772 | Port 13 -32780 | Port 21 -32788 | |
| | Port 6 -32773 | Port 14 -32781 | Port 22 -32789 | |
| | Port 7 -32774 | Port 15 -32782 | Port 23 -32790 | |
| | Port 8 -32775 | Port 16 -32783 | Port 24 -32791 | |
| Port Priority | Indicates the priority of a specific port in relation to other ports. | | | 128 |
| Cost Component of Each Port | The Spanning Tree Protocol calculates and ensures that an active topology generates minimal cost paths. A value of 100 is generally used for 10Mb/s Ethernet networks and a value of 10 is generally used for 100Mb/s Ethernet networks. A value of I is used for 1000 Ethernet networks. | | | 10 |

For detailed information on the operation of the Spanning Tree Protocol, consult Section 4 of IEEE Standard 802.1D, ISO/IEC 10038:1993.

# Spanning Tree Protocol Operation

When the Spanning Tree Protocol is enabled for the first time or when there is a change in the network topology, such as a failure or the addition or removal of a component, the Spanning Tree Protocol automatically sets up the active topology of the current network.

## Communicating Between Bridges

Periodically, all devices running the Spanning Tree Protocol on a network transmit packets to each other "in care of" the Bridge Group Address which all bridges share. When a bridge receives a frame sent to the Bridge Group Address, the bridge's Spanning Tree Protocol processes the packet. Application software and other LAN segments ignore the packet. Bridges communicate between each other in order to determine the Root Bridge.

## Selecting a Root Bridge and Designated Bridges

During communication between bridges, one bridge is determined to have the lowest bridge identifier. This bridge becomes the Root Bridge.

After the Root Bridge has been selected, each LAN segment looks for the bridge that has the lowest cost relative to the Root Bridge. These bridges become Designated Bridges.

## Selecting Designated Ports

Each Designated Bridge selects a Designated Port. This port is responsible for forwarding packets to the Root Bridge.

## Handling Duplicate Paths

When the active topology of the network is determined, all packets between any two nodes in the network use only one path. Where a duplicate path exists, the non-designated port is put into a blocking state.

## Remapping Network Topology

If there is a change in the network topology due to a failure or the removal or addition of any active components, the active topology also changes. This may trigger a change in the state of some blocked ports. There are five (5) states that the ports can be in for spanning tree:

- Blocking: A port in this state does not participate in the transmission of frames, thus preventing duplication arising through multiple paths existing in the active topology of the bridged LAN.
- Listening: A port in this state is preparing to participate in the transmission of frames. The transmission of frames is temporarily disabled in order to prevent temporary loops, which may occur in a bridged LAN during the lifetime of this state as the active topology of the bridged LAN changes.
- Learning: A port in this state is preparing to participate in the transmission of frames.
- Forwarding: A port in this state is participating in the transmission of frames.
- Disabled: A port in this state does not participate in the transmission of frames or the operation of the spanning tree process.

# *Appendix C*
# Virtual LANs (VLANs)

## VLANs and Frame Tagging

The SW3322/SW3323/SW2234 supports IEEE 802.1Q-compliant VLANs. This capability provides a highly efficient architecture for establishing VLANs within a network and for controlling broadcast/multicast traffic between workgroups. Central to this capability is an explicit frame tagging approach for carrying VLAN information across interconnected network devices.

With frame tagging, a short tag is appended to the beginning of every frame that crosses the network. The tag identifies which virtual LAN the frame belongs to as well as the relative priority of the frame In Figure C-1, the workstations attached to the first switch are members of the same two VLANs as the workstations attached to the second switch. The 802.1Q tag carries the VLAN information between the two switches.

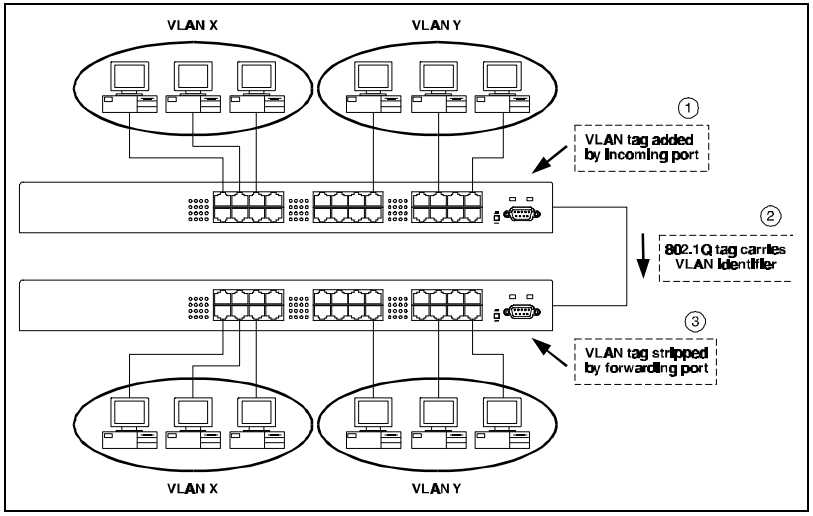



**Figure C-1** Two Switch VLAN Configuration

If the switch is so configured, a unique VLAN identifier is placed in a tag appended to the packet when it is received by the switch from end-station nodes, if the packet does not already contain this information. The tag is then stripped off when the packets are forwarded to the destination end stations. Within the switch and between switches compliant with IEEE 802.1Q, these identifiers are used to control the destination of broadcast frames and to prevent flooding these broadcasts to all ports and connected interfaces.

Broadcast/multicast traffic from geographically dispersed stations can be directed across these links without radiating out to stations that are not part of the same VLAN. Up to 4094 different VLANs can be carried across these links, thus permitting the configuration of up to 4094 virtual workgroups. This approach is nonintrusive to end-station applications and the associated clients. You can configure VLANs using the VLAN Menu in the console interface and associated submenus, or via SNMP.

## VLAN Access Ports

SW3322/SW3323/SW3324 ports can be configured as one of two types for the purpose VLAN configuration: access or hybrid. A VLAN access port is used to connect one or more VLAN-unaware devices into a port of a VLAN device. There can be no VLAN tagged frames entering an access port. If a tagged frame does arrive on an access port, the switch will drop the frame. You can configure a port as an access port (typically one connected to a VLAN-unaware end-user workstation) to ensure that it only receives untagged frames.

In the following example (Figure C-2), both ports are designated as access ports. The ports are both configured to be on VLAN X. The untagged frame (1) comes in through the left port and gets tagged with a VLAN X tag (2), based on the incoming port. As the frame comes out through the right side port, the tag is stripped (3) since the outgoing port is an access port as well and only accepts untagged frames. The incoming and outgoing frames can only propagate in this example because they are on the same VLAN.

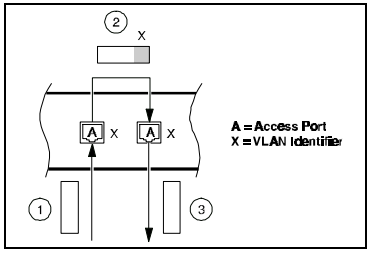



**Figure C-2** VLAN Access Ports

# VLAN Hybrid Ports

A VLAN hybrid port is used to connect one or more VLAN-aware or VLAN-unaware devices attached to it. Both tagged and untagged frames can be transmitted on hybrid ports.

In example 1 in Figure C-3A, two different VLANs are configured as X and Y. A packet arrives (1) with a tag for VLAN Z, goes straight through the switch (2) and back out (3), destined for VLAN Z, a VLAN Z-aware end-user workstation. If the packet already has the tag attached, then the switch uses that information, transparent to the VLAN configuration of the incoming port used for that packet's arrival. The switch forwards the packet so that it reaches its ultimate destination.

In Example 2 in Figure C-3A, a similar scenario to Example 1 occurs, except that the incoming packet (1) is tagged with a VLAN Y tag. The packet is being sent (2) to a port that belongs to VLAN Y. Since VLAN Y exists on the port, the tag is stripped off (3).

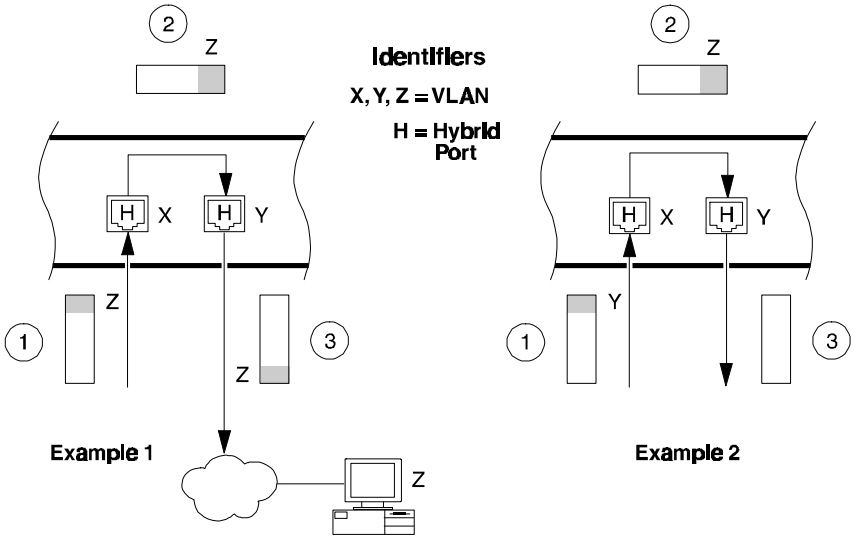



**Figure C-3A** VLAN Hybrid Ports (Examples 1 and 2)

In example 3 in Figure C-3B, an untagged frame arrives at the left side port (1). The frame is tagged with a VLAN X tag (2), and comes out Port Y with a VLAN X tag (3). The ultimate destination of the frame may be on the outgoing port's segment or on another segment.

Example 4 in Figure C-3B, is similar to Example 3 except that both ports (incoming and outgoing) are on VLAN X. The untagged frame arrives at incoming port X (1), gets tagged with a VLAN X tag (2), and comes outs VLAN X (3) with the tag stripped off. The packet thus comes in and out of the switch port untagged, the same as the access port type case in Figure C-2.

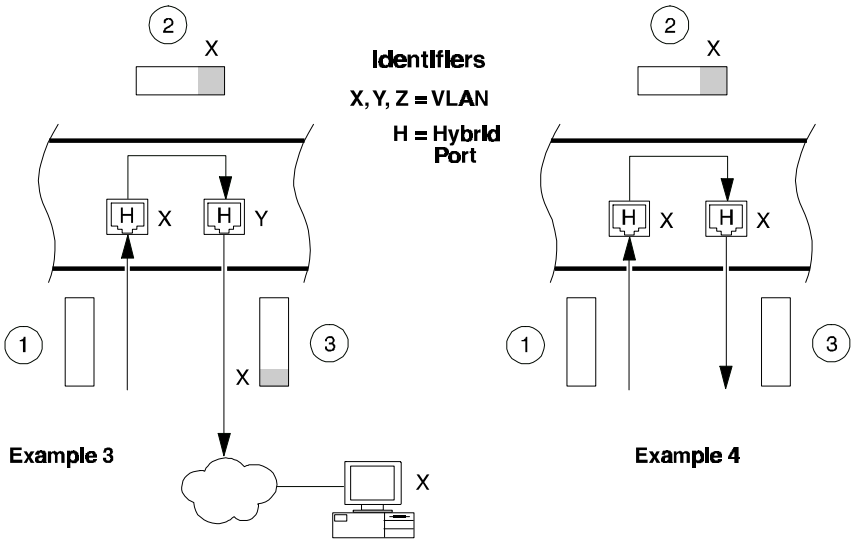



**Figure C-3B** VLAN Hybrid Ports (Examples 3 and 4)

## VLAN Application Example

As the network administrator can use VLANs to define user groups regardless of the physical LAN segment to which they are connected, both hybrid and access links can further refine traffic flow in a multi-switch environment. Figure C-4 shows the combination of both hybrid and access links for a network with three different VLANs. Note that VLAN Y packets are tagged on the internal (corporate) network, but VLAN Z packets are not. No packets are tagged on the access links.

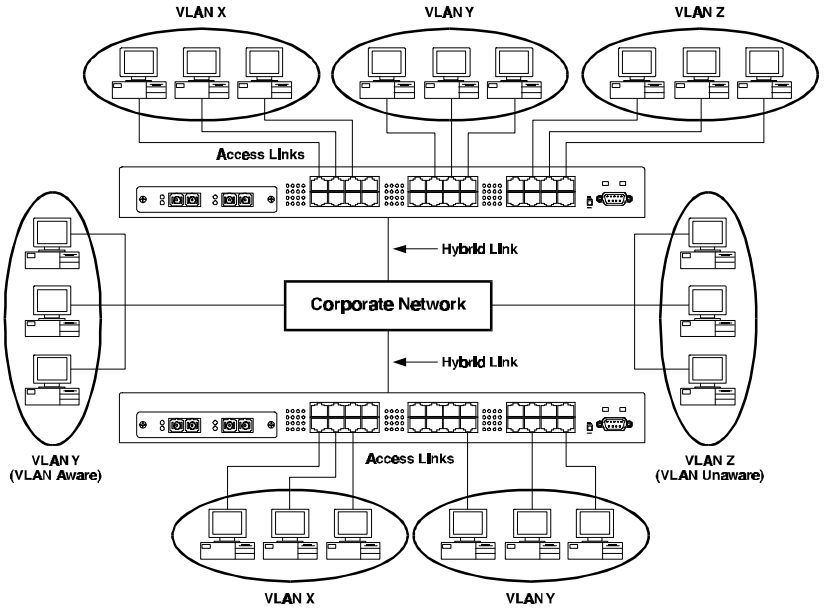



**Figure C-4** VLAN Application Example using SW3323 Switches

# *Appendix D*
# Class of Service

Class of Service support allows you to assign mission-critical data a higher priority through the switch by delaying less critical traffic during periods of congestion. Higher priority traffic through the switch is serviced first before lower priority traffic. The Class of Service capability of the SW3322/SW3323/SW3324 switch is implemented by a priority queuing mechanism. In order to use Class of Service (priority queuing) you must first enable VLAN operation on the switch. Class of Service is based on the IEEE 802.1p draft standard specification and allows you to define two priorities of traffic on each switch port:

- high
- normal

As traffic enters the switch, it is assigned to one of the two priority levels according to information located in the header tag of the packet (see Appendix D, “Virtual LANs”) or according to the incoming port number. Packets are then placed into one of two transmit queues on the outbound switch port based on their priority level. Packets on the high priority queue are transmitted first; when that queue empties, traffic on the normal priority queue is transmitted. When priority queuing is being used, each packet that passes through the switch contains a priority level in its header tag. The priority information may already exist in incoming packets, or be assigned by the switch. The determination of individual packet priority is based on the following rules:

1. Incoming tagged frames contain a priority level (range: 0-7)
2. Incoming non-tagged frames are assigned a preconfigured default priority level based on their incoming port (range: 0-7)
3. Priority levels of packets are compared against a preconfigured global priority threshold setting. Those packets with levels equal to or above the threshold are designated high priority traffic; those packets with levels below the threshold are designated normal priority traffic.
4. Default settings: 4 and above = High Priority, 3 and below = Normal Priority

Properly configured, this mechanism assures that during congestion, normal priority traffic does not delay the highest priority data. The tagged header in the frame governs individual frame priority. Figure D-1 shows priority queuing operating within a switch. Packets coming in through ports 1 and 4 are tagged as normal traffic and placed in a normal queue on an outbound port. Packets coming in through ports 2 and 5 are tagged as high priority traffic and placed in a high priority queue on an outbound port. You can configure priority queuing using the Class of Service Configuration Menu in the console interface or via SNMP.

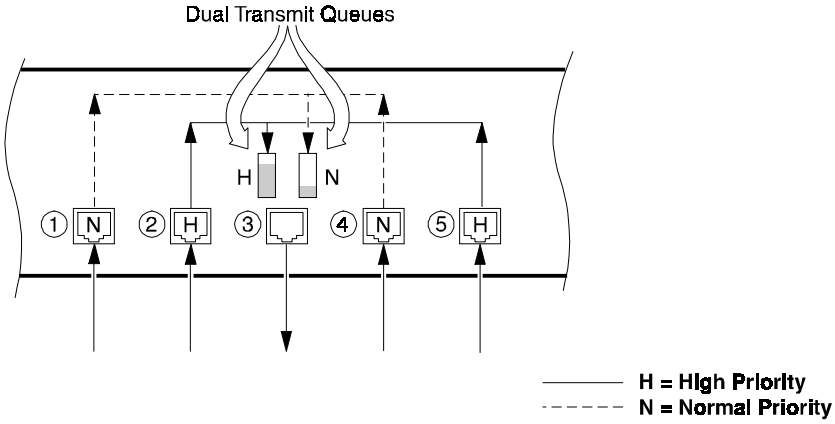



**Figure D-1** Class of Service Example

# *Appendix E*
# Acronyms and Abbreviations

| | |
|---|---|
| 10Base-T | 10 Mbps twisted-pair Ethernet |
| 100Base-TX | 100Mbps twisted-pair Ethernet |
| 1000Base-SX | Ethernet Fiber 1000Mbps Short Wavelength |
| 1000Base-LX | Ethernet Fiber 1000Mbps Long Wavelength |
| ANSI | American National Standards Institute |
| ASIC | Application Specific Integrated Circuit |
| BootP | Bootstrap Protocol |
| BPDU | Bridge Protocol Data Unit |
| CAT5 | Category 5 |
| CoS | Class of Service |
| CRC | Cyclic Redundancy Check |
| CSMA/CD | Carrier Sense Multiple Access/Collision Detection |
| DCE | Data Communications Equipment (modem) |
| DHCP | Dynamic Host Configuration Protocol |
| DSR | Data Send Ready |
| DTE | Data Terminal Equipment |
| DTR | Data Terminal Ready |
| ICMP | Internet Control Message Protocol |
| IEEE | Institute of Electrical and Electronics Engineers |
| IP | Internet Protocol |
| LAN | Local Area Network |
| MAC | Media Access Control |
| LED | Light Emitting Diode |
| MDI | Media Device Interface |
| MIB | Management Information Base |
| RFC | Request for Comment |
| RMON | Remote Monitoring |

| | |
|---|---|
| RXD | Receive Data |
| SNMP | Simple Network Management Protocol |
| STP | Spanning Tree Protocol |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| TFTP | Trivial File Transfer Protocol |
| TXD | Transmit Data |
| UTP | Unshielded Twisted Pair |
| VLAN | Virtual Local Area Network |
| WAN | Wide Area Network |

# *Appendix F*
# Regulatory Compliance

## FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

### Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Compaq Computer Corporation may void the user's authority to operate the equipment.

### Cables

The cables you supply when connecting to this device must be shielded cables with metallic RFI/EMI connector hoods to maintain compliance with FCC Rules and Regulations.

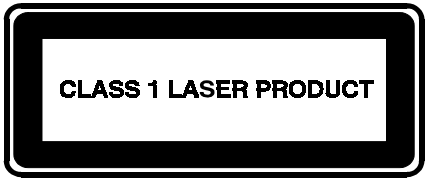
### Laser Compliance

The GBIC Module contains a laser diode of either gallium aluminum arsenide (GaALAs) emitting in the wavelength range of 770-860 nm, or indium gallium arsenide phosphide (InGaAsP) emitting in the wavelength range of 1270-1355 nm. All Compaq systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous laser radiation.

**WARNING:** To reduce the risk of exposure to hazardous radiation:

- Do not try to open the unit enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only Compaq Authorized Service technicians to repair the unit.

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States. This device is classified as a Class 1 laser product as defined by IEC 825.




This label indicates that the product is classified as a CLASS 1 LASER PRODUCT.

| | |
|---|---|
| Laser Type | Semiconductor GaAlAs or |
| Wave Length | 770-860 nm1270 |
| Divergence Angle | Minimum 15 degrees |
| Output Power | Less than 0.2 mW /10,869 $W \cdot m^{-2}$ $sr^{-1}$ |
| Numerical Aperture | 0.45 +/- 0.04 |

## Canadian Notice

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

## Avis Canadien

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## European Union (EU) Notice

Products with the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European Norms (in brackets are the equivalent international standards):

- EN55022 (CISPR 22) - Electromagnetic Interference
- EN50082-1 (IEC801-2, IEC801-3, IEC801-4) - Electromagnetic Immunity
- EN60950 (IEC950) - Product Safety

## Japanese Notice

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

## Taiwanese Notice

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

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